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Mother-Infant Interaction: Achieving Synchrony

by

Deborah Bridget Leitch

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for the
Degree of Masters of Nursing

Faculty of Nursing

Edmonton, Alberta

Spring 1996

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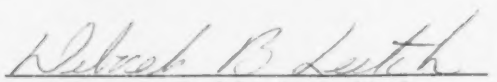

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Date thesis approved: April 16, 1996

NCAST

Nursing Child Assessment Satellite Training

April 8, 1996
Debbie Leitch
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Dear Debbie,

You certainly have my permission to use our NCAST Teaching scale and the Difficult Life Circumstances scale in your thesis. I look forward to receiving a copy of your thesis for our library.

This abstract is fascinating and would be great to add to our July newsletter if possible. If at some time you find the time to write up this study for publication I would be interested in also publishing your findings. I am so pleased to know that parents can learn and retain information about newborns during the prenatal period. Reva Rubin listen up.

I look forward to hearing from you again.

Sincerely,

Georgina Sumner

Georgina Sumner
Director NCAST

FROM:OMNIFAX TO: 403 492 2551 APR 19, 1996 8:22AM #125 P.02

This thesis is dedicated to my husband, John for his patience, understanding and support throughout my studies.

Abstract

The purpose of this experimental study was to examine the effect of infant communication education presented prenatally to first time mothers, on the quality of interaction of the dyad within the first twenty-four hours following birth. Twenty-nine first time mothers were randomly assigned to either an intervention or control group. The intervention group received education on infant behaviors, states, and communication cues. A specific mother-infant interaction was videotaped and scored using the Nursing Child Assessment Teaching Scale. The scores between groups were compared to determine the effect of education on the interaction that occurred between the dyad. Significant intervention effect was found in the overall totals $t(27) = 1.69$; $p = .05$ as well as in the contingency scores related to sensitivity to cues $t(27) = 1.93$; $p = .05$ and social emotional growth fostering $t(27) = 1.93$; $p = .05$. Findings from this study support a health promotion intervention which can foster optimum growth and development of both parent and child within the constraints of today's existing health care system.

Preface

The quality of interaction that occurs between the primary caregiver and infant provides the foundation for cognitive and social development of the child. The quality of interaction between the parent-child dyad is influenced by the characteristics of the child, parent, and environment. When the parent is able to respond to the communication cues of the infant and the infant is in turn able to respond to the caregiver, parent-infant synchrony develops which promotes optimum cognitive, social, and linguistic development. Through education and support, the nurse is able to assist in the facilitation of parental competence in interpreting the responses and behavioral cues of the infant. Shortened hospital stays and restricted community resources limit the opportunity for education following the birth of the baby. It is the goal of this research to provide an outcome measurement of the effect of teaching in the prenatal period on the quality of mother-infant interaction after birth in an effort to support prenatal education which includes information on infant states, behaviours and cues.

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Abbreviations/Symbols

List of abbreviations used within this text:

NCAST - Nursing Child Assessment Satellite Training program

NCAT - Nursing Child Assessment Teaching scale

RDRHC - Red Deer Regional Hospital Centre

Data collected on each of the categories in the NCAT scale is reported using the following abbreviations:

SC - Sensitivity to cues
RD - Response to distress
SE - Social emotional growth fostering behaviours
CG - Cognitive Growth Fostering behaviours
T - Total score for the caregiver
CC - Clarity of cues
RC - Responsiveness to caregiver
CT - Child total score
OT - Overall total score for both caregiver and child
CS - Contingency sensitivity to cues
CR - Contingency response to distress
CSE - Contingency social emotional growth fostering
CCG - Contingency cognitive growth fostering
CCT - Contingency caregiver total score
CRC - Contingency responsiveness to caregiver
COT - Contingency overall total score
ED - Education level of the participant
SS - Social Support reported by the participant
ENG - Energy level of the mother at time of assessment
DLC - Difficult Life Circumstances scale

Introduction

Can nursing make a difference in the quality of interaction that occurs between a parent and a newborn infant? Parent-child interactions form the foundation of a trust building relationship that enables a child to progress through the stages of normal growth and development (Erickson, 1963). When interactions are impaired, the child becomes at risk for developmental delays, social, cognitive and linguistic limitations, child abuse, malnutrition, neglect and failure to thrive (Aydlett, 1993; Bakeman & Brown, 1980; Beal,1986; Bristor, Hiefer, & Coy, 1984; Censullo, 1986; Farel, Freeman, Keenan, & Huber, 1991; Goldberg, 1990; Harrison & Twardosz, 1986; Jones & Herman, 1992; Jones & Lens, 1986; Klaus & Kennel, 1982; Lewis & Coates, 1980; Lobo, Barnard, & Coombs, 1992). Facilitation or promotion of quality interactions between the parent and infant may therefore, provide the child with the opportunity for optimum development. Maternal education related to infant communication has been shown to have a positive effect on mother-infant interaction when offered in the postnatal period (Anderson, 1981; Barnard et. al., 1987; Riesch & Munns, 1984; Poley-Strobel & Beckman, 1987; White-Traut & Nelson, 1988). However with a hospital stay of less then 24 hours for a non-complicated delivery, teaching opportunities are limited. Can infant communication education offered to the mother prior to the birth of the infant effect the interaction that occurs between the dyad following birth? Prenatal education would maximize the number of mothers who receive the education and serve as a valuable health promotion tool to effect positive parenting beginning at birth. The purpose of this study was to determine the effect of infant communication education prior to the birth of the baby on the interactions that occur between the mother-infant dyad in the first twenty-four hours after birth. A positive effect would provide an outcome measurement for a nursing intervention which would support the inclusion of infant communication education in the prenatal period.

Parent-Child Interaction

Parent-child interaction is any communication, verbal or nonverbal that occurs between the parent and the child that is met with a verbal or behavioural response with a valuative component. The interaction may be compared to a conversation and serves two major intentions: the communication of information and the building of social relationships (Bateson, 1971). If a conversation is to be effective, the participants must adhere to certain rules of behaviour such as eye contact, acknowledging gestures, appropriate responses, pauses, and 'turn taking' in speaking and listening. The same is true with the conversation that occurs between an infant and a parent. As this relationship is the infant's first exposure to learning how to carry on a conversation it provides a critical foundation for future social and emotional development.

The major consequence of parent-child interaction is that the parent influences the child and the child influences the parent so that both are changed and mutual modification occurs (Huber, 1991). If the caregiver ignores or misreads an infant's communication or is overly intrusive, preoccupied, or depressed, the infant's responses are random, chaotic, rigid, or stereotyped. If the caregiver reads and responds contingently to the infant then the infant develops affective, reciprocal interactions with the caregiver (Sullivan, 1991).

The quality of any interaction is influenced by the characteristics of the individual involved in the interaction as well as by the characteristics of the environment (Barnard, 1978; Capuzzi, 1989; King, 1981). Barnard (1978) suggests that in order for an interaction between a parent and a child to be effective, the infant and mother must give clear cues to each other, the mother must respond to the infant's cues, the infant must respond to the mother's cues, and the environment must facilitate the interaction that occurs. The interaction becomes a cyclical event which either reinforces the behaviour that occurs or facilitates its termination. As any interaction requires a response or outcome, there are certain abilities that each individual must possess in order to participate in the process. These abilities are referred to as competence (Anderson, 1981; Dickie & Gerber, 1980; Coffman, 1992; Farel, Freeman, Keenan & Huber, 1991; Goldberg, 1977; Jones & Lens, 1986; Olson, Bates, & Bayles, 1984). Parent competence is evidenced by the parent's ability to detect cues from the child and to respond appropriately with the correct activity such as feeding, changing, kisses, smiles, tone of voice, cuddling

or a pause or increase in stimulation. Infant competence is evidenced by the child's ability to respond to parental cues through eye contact, wakefulness, general arousal, irritability, crying, smiling, and movement (Brazelton & Cramer, 1990; Crnic, Ragazin, Greenley, Robinson & Basham, 1983; Harrison & Twardosz, 1986; Tomlinson, 1989). The reciprocal communication process that develops is referred to as synchrony (Censullo, Bowler, Lester, & Brazelton, 1982).

Characteristics of the Child

The characteristics of the child that may influence the quality of interaction that occurs are infant competence, state behaviours, and temperament.

Infant competence

A newborn's behaviour is not just reflex activity. It is goal-directed. In fact, infants are pre-adapted for interactions with adults and their ability to make eye contact, smile, and touch are just a few of the behaviours that an infant can use to signify the desire to participate in an activity or to take a break (Goldberg, 1977; Robson, 1967; Walker, 1992). The competent newborn, within an hour of birth is able to suck and root efficiently, alert to stimulation selectively, modulate states of arousal, and cry loudly when uncomfortable. The newborn is attentive to movement and sound. He or she is predictable, readable, and responsive and as such is capable of capturing the parent into cycles of effective interactions and generating parental feelings of efficacy. An incompetent infant has the ability to do the reverse (Goldberg, 1977). A feedback loop is developed in which the responses and behaviours of either parent or child effect a change or a response from the other. The feedback loop may be effected by factors such as lack of knowledge of infant behaviour, illness, depression, stress or crises (Anderson, 1986; Barnard, 1978; NCAST, 1995).

The characteristics of the child that may influence the interactions that occur include both physical and mental ability. If the child is unable to respond to the parent through eye contact, smiling, crying or relaxing, the feedback loop to reinforce the parent's interactive behaviours is absent and the quality of the interactions will diminish. Similarly if the child responds negatively to the parent's actions through increased irritability or distress, the reinforcement to the parent will be to discontinue that behaviour. If the child responds with smiles, eye contact, and cuddling, the parent's behaviour is reinforced and continues (Gottwald & Thurman, 1990;

Harrison & Twardosz, 1986; Jones & Lenz, 1986; Sullivan, 1991).

Temperament

A number of research studies have been completed on the effect of the child's temperament on the quality of parental-child interaction, provision of care, and developmental outcomes (Bell & Ainsworth, 1972; Crockenberg, 1981; Jones, 1981; Sroufe, 1985; Thoman, Acebo, & Becker, 1983; Zahr, 1987). The findings indicate that parents who are able to interpret their infant's communication cues experience less infant crying than those parents who do not correctly interpret their infant's cues. Could it be that when a child's language is not understood, the frustration that results evokes a more potent but less specific form of communication such as crying? Although children with irritable temperaments did not have any significant developmental delays, and parents did continue to meet the child's needs, the areas showing delay were in the realm of social competence. Did infant irritability cause poor interactions which led to social incompetence or did ineffective interactions caused by social incompetence create infant irritability? Further research is needed to address these questions and the effect of parent responsiveness or competency on infant temperament.

Infant state

The infant's state during an interaction is an important determinant of the quality of interaction that will occur. Barnard and Brazelton have identified six normal states for the infant including: quiet sleep, active sleep, drowsy, quiet alert, active alert, and crying (Barnard, 1978; Brazelton & Cramer, 1990). The caregiver who wishes to carry on a reciprocal interaction during the sleep or drowsy state will meet with little success. Yet it is common for a caregiver to wake an infant and expect the child to feed. "Variety to awaken" and "repetition to soothe" are two principles of state modulation (Barnard & Kang, 1987) that will assist the caregiver in maximizing the successful outcome of each interaction.

In addition to biological states, the infant is capable of certain behaviours and communication cues to indicate needs, desires, and satisfaction. Behaviours that a newborn is capable of include: orientation to face and voice, habituation, consolability, cuddliness, smiling, motor behaviour, irritability and readability. In addition the newborn is capable of communicating subtle and potent

cues to indicate the desire to engage or disengage in any activity (Sumner, 1990). The challenge that the caregiver faces is to sensitize to the infant's cues and behaviours and to respond appropriately. (Barnard, 1978; Brazelton & Cramer, 1990; Moss, 1966; NCAST, 1995).

Characteristics of the Parent

Characteristics of the parent that may influence the quality of interaction that occurs are: parental competence, expectations, emotional state, age, and experience.

Parental competence

Caregivers who are unaware of the infant's ability to communicate and misread the child's signals to engage or disengage in an activity (Anderson, 1986; Aydlett, 1993; Brazelton & Cramer, 1990; NCAST, 1995) may contribute to the development of a negative feedback loop in which the infant's behaviour or attempts at communication are not reinforced. The inability to correctly interpret an infant's cues creates an environment of frustration that is detrimental to the child-parent relationship. Correct interpretation will lay the foundation for the development of an effective relationship between the parent and child and the attainment of optimum growth and development.

The main task of parents during an infant's early months is to learn to recognize and respond to infant cues (Barnard, Morrisset, & Spieker, 1994; Sander, 1962). The period of initial adaptation of parent to child has been identified by Sander (1962) as between birth and two and one half months when the child develops rhythms of feeding, sleep, wakefulness, and elimination. This period of initial adaptation is stressful for the caregiver as the quest for synchrony between parent and child becomes a test of one's ability to fulfill the parenting role. Parent education, age, and experience play an important role in the accomplishment of this task, but an ability to interpret the infant's language is the crucial link.

The assumption of many longitudinal studies that compare the quality of interaction that occurs at birth and later at differing periods of time is that most parents are able to accomplish the task of parental competence through familiarity and proximity to their child (Blehar, Lieberman, & Ainsworth, 1977; Cohen & Beckwith, 1979). Unfortunately, not all parents are able to achieve this. The result is the creation of a negative feedback loop and identification of the parent-child dyad as "high risk" (Barnard, Bee, & Hammond, 1984). Many clinicians have worked to identify the high risk group of

parents by assessing the quality of interaction that occurs at birth and at about two weeks of age. Interventions are then planned to assist the parent in this higher risk grouping (Buckner, 1983; Barnard et al., 1987; Barnard, Morsisset & Speiker, 1993; Slater, Naqvi, Andrew, & Haynes, 1987). Today, however with shortened hospital stay and limited community resources a new method of assisting the parent to accomplish the task of synchrony is necessary. The ability to target all new parents would identify and assist in the reduction of those dyads at risk.

Parental expectations

Inappropriate parental expectations of infant behaviour are consistently identified as detractors to positive parent-child interactions when the child is different from what was expected (Bristor, Hiefer, & Coy, 1984; Censullo, 1986; Farel, Freeman, Keenan, & Huber, 1991; Harrison & Twardosz, 1986; Jones & Herman, 1992; Jones & Lens, 1986; Quinn, 1991). This may result from the fact that parents are unaware of what behaviour to expect from their child and so do not know how to respond appropriately. Research with parents of premature or handicapped babies has indicated that when parents are taught about their child's responses that the quantity and quality of interactions increase (Barnard et al., 1987; Bristor, Hiefer, & Coy, 1984; Palisana, Chirallo, & Haley, 1993; Ziloko, 1991).

Emotional state

The emotional state of the caregiver plays a major role in the ability to interact positively. A mother who is depressed, anxious, or stressed, is unable to attend to or correctly interpret her infant's communication cues or behaviours (Barnard, 1978; Dormie, Strauss, & Clarke, 1989). These findings are congruent with crises theory which suggests that stress causes an inner focus in individuals which interferes with the ability to attend to environmental cues (Teel, 1991). Consideration of emotional state is essential when planning any assessment or teaching intervention with the parent or caregiver.

Age, experience and education

A parent's age, comfort level in the ability to provide necessary care, self esteem, and educational preparation have also been found to influence the interaction that occurs between parent and child (Barnard, 1978; Jones & Lens, 1986; Williams, Williams & Grigg,

1990). In fact these characteristics in the mother figure have been found to be the best predictors of the child's cognitive and social development (Bee et. al., 1982; Coates & Lewis, 1984; Ramey, Farren & Campbell, 1979; Ruddy, & Barnstein, 1982). Awareness of this finding reinforces the need for interventions which will increase maternal knowledge and confidence in the parenting role.

Characteristics of the Environment

The environment is the third factor that influences parent-child interactions. The environment consists of any animate or inanimate supports that surround the dyad of parent and child. In addition it is important to see the parent or caregiver as the environment for the child and the child as the environment for the parent.

The environment may take the form of physical and mechanical supports necessary to maintain life or social and interpersonal supports available from other family members, the community or health care personnel. Barnard (1978) in her Child Health Assessment Interaction Model describes how the parent, child, and environment are in constant interaction and how each effects the other in some way. King (1981) expands upon this idea in her Systems Model of Nursing by suggesting that it is through the promotion of quality interactions that transactions and goal attainment are achieved. The nurse as part of the environment in which the dyad communicates may be able to play an important role in the facilitation and promotion of quality interactions between the parent and child.

Physical environment

The physical environment that influences the quality of interaction that occurs may be the effect of lighting, auditory stimulation, equipment that interferes with physical contact, and the activity level around the dyad (Gottwald & Thurman, 1990). In an intensive care setting, the equipment may have an intimidating effect upon the care giver and interfere with the ability to communicate with the child. In the home or maternity ward, frequent interruptions caused by the telephone or visitors, may interfere with the parent's ability to interpret his or her infant's cues. Indeed the HOME inventory scale has been frequently related to quality of interactions between parent and child and subsequent developmental outcomes (Barnard, Bee, & Hammond, 1984; Caldwell, 1978; Elardo, Bradley & Caldwell, 1975; NCAST, 1995). Awareness of factors in the physical environment which will support or

hinder interactions between the dyad is an important part of any educational intervention with the caregiver.

Social support

Social support has also been identified as an important variable in the environment that influences the quality of interaction that occurs and hence maternal attachment that may develop (Dormir, Strauss, & Clarke, 1988; Norbeck, Lindsey & Carrier, 1981), and may be provided by family members, friends, relatives and health care providers. When parents perceive their behaviours as successful in meeting the needs of their child, they see themselves as competent care givers and as having fulfilled the role of parent. When they feel unsuccessful in meeting the needs of their child, they feel incompetent (Harrison & Twardosz, 1986). Nurses may influence the interaction that occurs between parent and child by teaching the parents about expected responses from the child and through validation of parental observation of child performance (Barnard, 1978; Dickie & Gerber, 1980; Mogan, 1987).

The caregiver is also a part of the child's environment and as such may influence the quality of interaction that occurs by such simple measures as positioning, voice, sensitivity to cues, affect, and responsiveness (Blank, 1986; Bell & Ainsworth, 1972; Cusson, & Lee, 1993; NCAST, 1995). If the caregiver is anxious; the child will be anxious. The parent who is able to remain calm and confident in the provision of care will evoke a similar response in the infant.

Role of the nurse

Because the characteristics of the parent, child, and environment play such a significant role in the quality of interactions that are possible between a parent and child this is the area in which the nurse may have the greatest impact in effecting positive relationships and promoting optimal health. As a part of the environment in an educational and social support role the nurse may be able to influence the characteristics of the parent in terms of ability to interpret the child's communication cues and to respond appropriately (Crockenberg, 1981). The nurse can effect the parent's self-esteem, knowledge, confidence, and competence through education, role modeling, and support. The effect of these interventions is to set up a positive feedback loop in which desirable behaviours are reinforced. Educational intervention provided prior to the establishment of negative behaviour patterns between the

mother-infant dyad would have the greatest impact on health and social wellness.

Characteristics of the Interaction

The terms interaction, communication and transaction are frequently interchanged in the literature, yet a comparison of definitions would suggest that synonymous use is not appropriate.

Webster (1981) defines interaction as a mutual or reciprocal action or influence, a causal action between physical events, between mental events and also between mental and physical events and as a measure of how much the effect of one statistical variable upon another is determined by the values of one or more other variables. Reciprocal is defined as shared, felt or shown by both sides. The key words in the definition are mutual, reciprocal, influence, causal action and effect. These words signify active involvement by both participants. King (1981) supports this interpretation by stating that:

> "an assumption underlying the interaction process is that of reciprocally contingent behaviour in which the behaviour of one person influences the behaviour of the other and vice versa" (p 85).

Communication is defined as a process by which information is exchanged (Webster, 1981). This definition does not imply cause and effect, response or influence. King (1981) elaborates upon this definition by stating that:

> "communication is the structure of significant signs and symbols that brings order and meaning to human interaction" (P. 62).

Transactions are defined by King (1981) as:

> "a process of interaction in which human beings communicate with the environment to achieve goals that are valued" (p. 81).

A parent-child interaction therefore, is any communication, verbal or nonverbal that occurs between the parent and the child that is met with a verbal or behavioural response with a valuative component. The quality of the interaction that occurs is influenced by the characteristics of each individual involved in the interaction as well as the characteristics of the environment (Capuzzi, 1989; King, 1981).

Attributes

The defining attributes of a parent-child interaction are verbal or nonverbal communication between a parent and a child that meets with a response. The interaction may be qualified as positive or negative in terms of achieving goals that are valued.

Antecedents

Parent-child interaction is the process by which the child and parent develop a harmonious relationship referred to as "maternal attachment" (Capuzzi, 1989; Organek, 1992). In order for a parent-child interaction to occur the following factors must be met: there must be a parent and a child, the parent must be capable of interaction and able to assess the cues or response that the child provides, the child must be capable of responding to or eliciting a response from the parent and the environment must facilitate the interaction. It is the characteristics of the parent, child, and environment that will determine the 'quality' of the interaction that occurs (Tedder, 1991).

Consequences

The long term consequences of parent-child interaction are: reinforcement or extermination of behaviour (Aydlett, 1993), role attainment or role ambiguity (King, 1981; Barnard, Gottwald & Thurman, 1990; Organek, 1992), bonding or neglect (Klause & Kennell, 1982), adaptation, failure to thrive (Lobo, Barnard & Coombs, 1992), social, linguistic, and cognitive development or delay (Aydlett, 1993; Bristor, Hiefer & Coy, 1984; Censullo, 1986; Farel, Freeman, Keenan & Huber, 1991; Goldberg, 1990; Harrison & Twardosz, 1986; Jones & Herman, 1992; Lobo, Barnard, & Coombs, 1992), and goal attainment (King, 1981).

Caregiver-child interactions are readily identified by assessment during feeding or play. The Nursing Child Assessment Teaching Scale (See Appendix A) is a tool which enables the researcher or clinician to assess the quality of interaction that is occurring between the dyad.

Achieving Synchrony

Based on the factors that have been identified as influencing the interaction that occurs between parent and child, one would assume that any intervention that would alter a variable might influence the communication process. As the innate characteristics of the child are difficult or impossible to alter, interventions practiced to date have focused on the behaviours of the mother or primary caregiver. The goal of these interventions has been to increase competence of the parent in interpreting and responding to the infant's communications cues by alleviating distress and promoting growth fostering behaviours; in essence to promote synchrony (Aydlett, 1993; Barnard et al., 1987; Barnard, Morrisett, & Spieker, 1993; Bristor, Hiefer & Coy, 1984; Buckner, 1983; Cusson, 1993; Dickie & Gerber, 1980; Dormir, Strauss, & Clarke, 1988; Poley-Stobel & Beckman, 1987; Reich & Munns, 1984; Sullivan, 1991; Tedder, 1991; White-Traut & Nelson, 1988; Ziolko, 1991). There are several tools which are available to assist the nurse in this teaching including the Keys to CaregivnG program (Sumner & Barnard, 1990), the Nursing Child Assessment Satellite Training (NCAST) tools (NCAST, 1995), and Brazelton's (1973) Neonatal Behavioural Assessment Scale. The nurse using these tools is able to assist the parent to see the child as a unique person with special skills and behaviours.

The Barnard Model

Both the Keys to CaregivinG program and the NCAST tools are based on the Barnard Model (NCAST, 1995) which suggests that an effective interaction between a caregiver and child is dependent upon characteristics of both partners. Each participant has certain responsibilities to promote and maintain the interaction that occurs. The caregiver's responsibilities are to be sensitive to the child's cues, to alleviate distress and to provide growth fostering behaviours. The infant's responsibilities are to give clear communication cues and to respond to the caregiver. As a result of the demonstration of these responsibilities each partner responds and adapts to the other to perform a smooth dance or adaptation of behaviour.

Factors that interfere with the dance may originate from either partner or the environment. For instance, the caregiver may not be sensitive to the infant's cues because of stress or lack of knowledge. The infant may not give clear cues because of physical conditions. Each partner must be capable of interacting behaviours such as

smiling, vocalizing, and movement. A response that is contingent upon the other's behaviour will serve to reinforce or mold that behaviour. It is this contingent behaviour which is the true measurement of the interaction and leads to the achievement of synchrony between the dyad. The NCATS scores the mother and infant on contingency behaviours in five of the six overall categories tested and as a result provides an excellent outcome measurement to determine the effect of an education intervention on the attainment of synchrony between the dyad.

As it is difficult to alter the characteristics of the child, interventions to promote quality interactions between the caregiver and child have focused primarily on altering the characteristics of the caregiver and the environment.

Intervention Research

Intervention research which looks at increasing parental competence has focused education of the primary caregiver on infant states, behaviours, and communication cues. In all studies however, the interventions have been introduced following the birth of the infant and usually with a population that was assessed to be at higher risk for ineffective communication patterns.

Studies with term infants

Anderson (1981) conducted an experimental study in which 30 mothers of healthy term babies were assigned to three groups: a control group who received information about baby furniture, experimental group 1 who received teaching and demonstration of infant behaviours, and experimental group 2 who just received verbal teaching about infant behaviours without the infant present. Interactions were assessed using the NCAFS (Nursing Child Assessment Feeding Scale) both pre-intervention and 10-12 days post delivery. There were significantly greater gains in the quality of interactions that occurred between the two treatment groups compared to the control group as well as significant gains in maternal behaviour between the demonstration group and the teaching only group. This would indicate that although teaching and demonstration is the most effective intervention, the teaching alone was also effective at least to some degree. One must wonder if there were other confounding variables that may not have been accounted for, such as the timing of the teaching and other stress or environmental factors that may have influenced the results. In addition the sample size was

relatively small. A repeat study that would control for these variables would be valuable.

Riesch and Munns (1984) tested the effect of a teaching intervention on maternal awareness of interactive behaviours. One hundred and eight mothers and healthy term babies were randomly assigned to intervention and control groups. In addition 32 mothers and their healthy pre-term babies were also assigned to this intervention. The teaching in the form of audiotaped and printed material that covered newborn infant behaviours and strategies to elicit them was presented at 48 hours and 5 days post delivery respectively. On the third day in hospital and fourth day at home after discharge the mothers were observed feeding their babies for ten minutes. Following the feed they were asked to report infant and personal behaviour that they had recognized. The experimental group reports were more consistent with the observations made by the investigators then were the control group. This would indicate that teaching based solely on audio and visual material was indeed effective in promoting self awareness of personal behaviours as well as infant behaviours and would support a theory that education without demonstration and practice may be effective.

Poley-Strobel and Beckman, (1987) conducted an experimental study in which 20 black, low income, new mothers were randomly assigned to the control group or an intervention group. The intervention group received at home teaching 1-3 days post discharge from the hospital on methods of eliciting infant responsiveness and facilitation of infant behavioural capabilities. The result of the intervention was assessed by measures of mother-infant interaction, maternal perceptions of infant behaviours, and maternal self-confidence at 10-14 days following hospital discharge. The intervention group showed significant increases in maternal interactive behaviours but not in maternal perceptions of infant behaviours or in maternal self-confidence. While it is encouraging that the interventions did indeed influence a change in the type, quantity and quality of interaction that occurred, it is disappointing that maternal self-confidence had not been effected. However based on the sample selected, there may have been other variables such as stress and environment that may have effected the results.

Studies with pre-term infants

Barnard et al. (1987) utilized the NSTEP-P (Nursing Systems Toward Effective Parenting-Premature) protocol with 76 families over a four month period. Maternal interactive behaviours during feeding increased in both

cognitive and social emotional growth fostering behaviours. In addition, significant increases were found in three areas of the quality of home environment including: responsivity of the mother, provision of appropriate play materials, and opportunities for variety of daily stimulation. Intensive intervention definitely has a positive effect on the parent-infant relationship, but in today's health care economy this intensive therapy will not always be an option. The research question that needs to be answered is: Can the effect of a minimum intervention be maximized to produce the same benefit?

White-Traut and Nelson (1988) conducted research utilizing a control group, experimental group 1 who received information about the importance of talking or singing to their infant and experimental group 2 who were instructed to massage their infants for ten minutes followed by rocking for five minutes according to a set protocol. The sample consisted of 33 mothers and their pre-term infants. The massage group showed significant differences in the sensitivity to infant cues and cognitive growth fostering behaviours. This study does indeed support the theory that proximity and getting to know the infant is a crucial factor in developing parent-infant competence. Could knowledge of infant states, behaviours, and cues prior to the birth of the infant facilitate and expedite this adaptation process?

Results of these studies indicate that education of the primary caregiver does make a difference in the quality of interactions that are measured such as sensitivity to cues, responsiveness to distress, social-emotional growth fostering and cognitive growth fostering behaviours. In the studies reported to date however, all interventions have occurred following the birth of the infant and between the ages of two days and four months of age. At present the average length of hospitalization following a non-complicated delivery is twenty-four hours. This shortened hospital stay in conjunction with limited community resources makes it impossible to effectively teach or assess the interactions that occur between the mother and infant while they are hospitalized. Mother-infant dyads at risk will not be identified until there is an additional health problem which may present itself at a later date in the form of child abuse, neglect, developmental delay or social incompetence. Nursing must take a health promotion approach in the education of parents prior to the surfacing of these greater problems in order to maximize potential and minimize health and social risks.

Summary

Does parental education of infant states, behaviours, and communication cues need to occur following the birth of the infant to have an effect on the interactions that occur between the dyad? Can effective learning be achieved prior to the birth of the infant? Adult learning principles would suggest that this is possible and perhaps even desirable. In the early postpartum period the demands of a new infant and a recuperating body may interfere with learning. Prior to the birth of the infant, the parent may be under less stress. Learning can occur at the individual's own pace and the information can be integrated prior to the arrival of the infant, so that the parent may achieve earlier success in interpreting the child's behaviour and responding appropriately. This would set up a positive feedback loop that would reinforce the learning at a faster rate than might otherwise occur. A program that considers adult learning principles (Brundage, 1980) and motivational strategies (Wlodkowski, 1986) in the prenatal period may enhance retention of information and promote maximum skill development which will ultimately effect the child's health outcome in a positive direction. Education is effective in promoting parental competence. The effect of the timing of the educational interventions on parent-infant interactions needs to be studied as this may be one method of overcoming the difficulty of limited teaching opportunities in the immediate postpartum period.

Nurses can make a difference in the quality of interaction that occurs between a parent and child by manipulating and strengthening the factors that influence this communication process. It is possible to alter the characteristics of the parent and the environment through education and social support. Shortened length of hospital stay following the birth of an infant and limited community resources reduces the opportunity for parents to receive education or support to assist them in responding appropriately to their infants. For many children the result may be cognitive, linguistic, and developmental delay or even failure to thrive, neglect and abuse. The challenge for nursing is to find a way to continue to effectively prepare parents for the challenge that awaits them within the constraints of the existing system. Awareness of the consequences of interactions, factors that influence interactions, and interventions that have worked may be of assistance in determining how these needs may be met. Research to determine the effect of parental teaching during the prenatal period on the quality of interactions that occur within the adaptation period following the birth of the infant is required.

Research Method

Statement of Purpose

The purpose of this study was to determine the effect of infant communication education delivered in the prenatal period on the quality of interaction between the mother-infant dyad in their first 24 hours following birth.

Research Question

Does infant communication education delivered in the prenatal period effect the quality of interaction that occurs between a mother-infant dyad during the first 24 hours following birth?

Definition of Dependent Variable

Quality of mother-infant interaction is defined as any communication, verbal or nonverbal between the mother and child that is met with a vocal or behavioural response with a valuative component. This definition is operationalized through the use of the NCATS (1995) Nursing Child Assessment Teaching Scale and examines the caregiver's sensitivity to infant cues, response to infant distress, social-emotional growth fostering behaviours, and cognitive growth fostering behaviours as well as the infant's clarity of cues and responsiveness to the parent. In addition, contingency responses between the caregiver and child are scored. These scores represent the true 'interaction' that occurs. See Appendix A.

Definition of Independent Variable

Infant Communication Education is a 45 minute program based on the Keys to CaregivinG Program (NCAST, 1990) which consists of videotaped information on infant states, behaviours, communication cues and social and cognitive growth fostering behaviours. The Keys to CaregivinG parent handouts were also distributed. See Appendix B for content outline.

Research Design

The ability to randomly assign subjects to either a treatment or control group in conjunction with the inability to perform a pretest with the treatment group indicated that a between subjects after-only experimental design was appropriate (Campbell & Stanley,

1963). The treatment group participated in "Infant Communication Education" prior to the birth of the infant. The control group received routine teaching only. This consisted of information on feeding, cord care, the infant bath and risk factors with early discharge.

The dependent variable measured was the quality of interaction between the mother-infant dyad at 24 hours of age as measured by the Nursing Child Assessment Teaching Scale (NCATS, 1995). See Appendix A.

The NCATS as a Research Instrument

The NCATS is a tool that the nurse clinician or researcher may use to assess the quality of interaction that occurs between a caregiver and child when the child is between the ages of birth and three years of age. The tool consists of 73 binary items divided into five sub-categories to measure the caregiver's sensitivity to cues, response to distress, social-emotional growth fostering behaviours and cognitive growth fostering behaviours as well as the child's clarity of cues and responsiveness to the caregiver. The assessment is made when the caregiver is teaching the child a specific sensory-motor task. In addition, the tool attempts to capture contingency items in which the behaviour of one member of the dyad will effect a response from the other. It is this "dance" between the partners that will foster optimum developmental and social outcomes for both child and caregiver (Thoman & Browder, 1987). When quality interaction is the goal to be achieved, the NCATS becomes a valuable tool for both clinical and nursing research.

NCATS in Research

Used in research the NCATS provides a tool to expand upon family research at the subsystem level (Kristjanson, 1992; Walker, 1992). It offers the opportunity for mid-range theory development and provides support to guide clinical practice.

The benefits to using the NCATS tool for research reside in the large data base available to support its validity and reliability as well as the stringent process required to certify in its use.

Statistics have been acquired for mother-infant interactions based on culture, age, education, socioeconomic status and expectations of the parent as well as for age and health condition of the child (NCAST, 1995). While other tools have been useful in

determining descriptions of behavioural organization and differences and changes in behavioural organization (Walker, 1992), NCATS builds upon the findings of these studies to look at relations among variables and intervention outcomes. The NCATS has moved nursing research a step beyond pure description to a stage at which the tool may be utilized at the experimental design level.

The teaching scale differs from the Nursing Child Assessment Feeding Scale (NCAFS) in that the teaching scale measures the quality of an interaction that is in a novel situation as opposed to one that is well rehearsed as is the feeding interaction. This lends itself nicely to research as there is no need to "capture" a feeding episode. In addition, as the length of time required to complete the assessment is approximately five minutes, it is possible to assess a larger sample size. Because the situation is "strange" it allows the researcher to look at adaptive patterns of the dyad outside of the well rehearsed feeding episode. (Barnard, Booth, Mitchell, Telzrow, 1988).

The NCATS, rather than the NCAFS was chosen as the measurement tool for several reasons. In the immediate postpartum period, the initiation of breast feeding is frequently a stressful time for the new mother. It is often necessary for the nurse to assist the mother with establishing the feeding process. This would interfere with the data collection process. The Teaching scale would enable the mother to be free of the pressures involved in ensuring that her infant is feeding and therefore provide a more natural and unstressed interaction that would truly depict the effect of the independent variable. In addition, the teaching scale measures the quality of an interaction that is in a novel situation as opposed to one that should be well rehearsed as is the feeding interaction. As this study was conducted in the immediate postpartum period, and there was no opportunity for this adaptation to occur, the teaching scale was selected as the tool of choice.

Validity

Content validity for NCATS was initially derived from the Bayley Test of Infant Development, the Merrill-Palmer and Stanford-Binet Scales and later modified according to the observations of William Frankenburg (NCATS, 1995). Concurrent validity, or the ability to correlate measures taken at the same time is evident between the teaching, feeding, and Home scales and the Bayley Mental and Psychomotor Development Index

(Barnard, Hammond, Booth, Bee, Mitchell & Spieker, 1989).

Reliability

The 73 items in the scale have a high internal consistency. Cronbach's alpha for the total parent scores is .87 and for the total child it is .81. The contingency scores for the parent scales have an alpha of .82 and for the child it is .76. These scores suggest that the same dimension of behaviour is indeed being measured. Test-re-test reliability has been done on 30 dyads with a generalizability coefficient of .85 for the total parent score and .55 for the total infant score. There is greater stability of the parent scores than of the infant scores and this may be reflective of the adaptation and maturational process that occurs for the child over time. (Barnard et al.,1983) This presents a limitation of the tool in measuring the child's clarity of cues and responsiveness to the caregiver in the early neonatal period prior to the opportunity for adaptation to occur. However as the goal of this research is to facilitate this adaptive process, NCATS provides a ready outcome measurement tool.

A normative sample data base was developed from a large geographical area through the use of the Nursing Child Assessment Satellite Training (NCAST) program over a period of 15 years, The database from the NCAT scale consists of 2100 cases (NCATS, 1995). Certification to use the tools in research has been strictly controlled with the need to acquire an 85% inter-rater reliability score prior to utilization of the tool. This certification has ensured that the normative data acquired is reliable between researchers.
An inter-rater reliability score of 95% was attained between the raters for this study (range: 93-96%).

Limitations of NCATS in Research

The timing of assessing interactions is crucial, the observer must be able to catch the dyad at a time when infant state is amenable to the exchange. Environmental factors also play a role in the ability to accurately assess the interaction such as interruptions, fatigue, mood, and pain of either partner. In an effort to control for these factors, great lengths were taken to ensure appropriate timing and to consider energy and pain levels of the participants in the final analysis of the data. The tool is also criticized for utilization of one brief five minute assessment to determine the relationship that exists between the dyad and test

retest measures or triangulation with results from other tools is suggested (Gross, Conrad, Fogg, Willis & Garvey, 1993). As this study was designed to measure a specific outcome as opposed to the relationship that exists between the pair, triangulation with another tool was not done.

Another limitation of the tool is that normative data have been collected primarily on infants from 1-53 months of age (Barnard et al., 1989). There is a gap in statistics available on the population from birth to one month of age, yet the tool is recommended for use from birth. Data collected in the immediate postnatal period will add to the statistics available for this age group.

Another interesting finding is that there is no relationship to child outcomes at 1 month of age, but there is a significant relationship at 4 months of age. The outcomes measured tend to be IQ and development of the child at school age (Barnard et al. 1989). Is this an outcome or simply a correlation? If a tool is to be effectively operationalized, it must measure what it is developed to measure (Feetham, 1991; Gillis & Davis, 1992; Kristjanson, 1992). It is the responsibility of the user to recognize the limitations of the measurement while avoiding false assumptions about cause and effect or generalizability. A large quantity of research to date utilizing the NCATS has focused on correlations between the NCATS with a variety of different groups and developmental and IQ outcomes (NCATS, 1995). Only minimal research has utilized the tool as an outcome measurement for a specific intervention (Anderson, 1981; Barnard et al., 1987; Poley-Strobel & Beckman, 1987; Riesch & Munns, 1984; White-Traut & Nelson, 1988). As the focus of this study is the provision of a teaching intervention that focuses on the acquisition of knowledge around infant states, cues and behaviours, then the tool is appropriately used to determine the effect of the intervention on the parent's sensitivity to cues, response to distress, social-emotional and cognitive growth fostering behaviours, and most importantly, contingency responses of the dyad. A before and after test would provide the most valuable data, however a control sample and intervention group may provide the same data. It was necessary to closely determine which parts of the scale were appropriate to answer the research question.

When using the teaching scale it is important to be aware of the fact that the subscale which measures sensitivity to cues has the poorest internal consistency (Barnard et al. 1989). This leads one to question if indeed the scale provides a correct interpretation of cues that signal engagement or disengagement. Perhaps

the scale does not take into account the unique individuality of each parent and child and the dance that has been learned even before birth. The fact that internal consistencies of total scores are higher than those for individual sub-scale scores is also important for the researcher to remember when determining how to best answer the question being asked. The larger number of items involved in the total scores provides a more reliable basis for comparing groups than the individual subscale scores.

The other important factor to consider is that infant behaviour is less stable across tasks and that overall the sub-scales that measure the social-emotional growth fostering and cognitive growth fostering behaviours of the caregiver are the most consistent. This has important implications for the intervention researcher who wishes to use this tool to measure the effect of a teaching intervention on these specific behaviours.

The NCATS is based on a sound child-health assessment model which incorporates the interaction of three important elements; the characteristics of the parent, child, and environment. A change in any one of these three elements will effect the outcome or the interaction that occurs, and therefore it is an excellent tool to serve as an outcome measurement for a nursing intervention which is aimed at changing the characteristics of the caregiver, as is this study.

Setting

The Red Deer Regional Hospital Centre (RDRHC) was the setting for this study where permission to conduct the study was granted by the Director of Nursing. See Appendix C. Approximately 1800 deliveries per annum occur in this facility, 32% of which ar primiparas. The hospital provides level II Obstetrical services for Red Deer and Central Alberta.

The Infant Communication Education sessions took place in a conference room in the Maternal-Child area. Data collection occurred in each mother's individual private room within the first 24 hours following the birth of the infant.

As the timing of assessing interactions was crucial, each new mother was approached early in the morning following delivery to determine the approximate time of the infant's next feed. The researcher then arrived fifteen minutes prior to the scheduled feed time to position the camera and describe the teaching task to the mother. Each mother was assigned the same teaching task: to teach her infant to look at a rattle. The

mother was able to choose to wait until her infant awakened or to bring her child to an awake state through state modulation prior to initiating the teaching.

Sample

The target population for this study was all first time mothers who resided in Central Alberta and delivered their babies during the period of June-September, 1995 at RDRHC. A non-probability convenience sample was used with random assignment of groups to control for extraneous variables.

Selection criteria were as follows: mothers who had no previous experience at parenting and who were between the ages of 18 and 44, English speaking, and had a normal vaginal delivery. The infants were 36 weeks of gestation or greater and had a minimal birth weight of 2500 grams, APGAR scores of 7 to 10, no congenital or genetic abnormalities or handicapping conditions and deemed to be healthy by the attending physician. As social support, age and education have been positively correlated with NCATS scores (NCATS, 1995), demographic data (Appendix D) and the Difficult Life Circumstances Survey (DLC), (Barnard, 1988) were obtained. See Appendix E.

Originally, a sample size of 70 was to be used with 35 dyads in each group. This number would provide a power of .80 (Cohen, 1988) based on a medium effect size reported for the use of the NCAST tools in measuring maternal-infant interactions (Turley, 1985), while incorporating a 10% mortality rate. The mortality rate proved to be much higher however and only 29 dyads completed the study, 15 in the control group and 14 in the treatment group.

The first 70 mothers who registered in the obstetrical pre-admission clinic at RDRHC and who met the selection criteria and agreed to participate in the study were assigned to either the control or treatment group using a random assignment table. Following the birth of the infanteach participant had the opportunity to withdraw from the study at any time. In addition complications such as cesarean section, gestational diabetes, pregnancy induced hypertension, septicemia, small for gestational age, prematurity, low APGAR scores, difficult feeders, congenital anomalies, and respiratory difficulties were reasons for participant withdrawal and added to the reduced sample size.

Frequency distributions, box plot and stem and leaf displays were completed to specifically describe the population. See Appendix H.

Method

Mothers were contacted prenatally by telephone prior to their appointment at pre-admission clinic, by the researcher to determine interest in participating in the study. If interest was indicated, a letter of information (see Appendix F) was mailed to each potential participant. Following further description of the study and resolution of any concerns or questions, a consent form (Appendix G) was obtained upon visitation to the pre-admission clinic. At this time, random assignment to groups occurred.

The following schemata depicts the experimental design which was used:

Treatment group : RA--X--O
Control group : RA-----O

X refers to participation in the Infant Communication Education sessions prior to the birth of the infant. O refers to the observation of mother-infant interaction using NCATS within the first 24 hours following birth. In adherence with the consent to participation, all assessments or observations were videotaped to ensure accuracy of interpretation.

Data Collection

A pilot study with one mother was completed to determine any problem areas that might arise and to provide the opportunity to make revisions to the study. Specific areas which were reviewed included: timing of the educational session and observation, the physical environment and the feasibility of videotaping the interaction for later interpretation, interruptions, visitors, noise levels and the effect of fatigue and pain on the mother.

Reliability

The NCATS was used to rate the quality of interaction that occurred between the mother-infant dyad. The interaction was videotaped by the researcher and later rated. An inter-rater reliability score of 95% (range 93-96%) was achieved by the two research assistants who scored the tapes. Each rater had received previous certification in the use of the NCAST tools through the University of Washington. Reliability was achieved by comparing the total number of disagreement items on each assessment. As an 85% reliability rate is acceptable for the use of the tool, the reliability for this study was excellent and should have helped to minimize any instrumentation effects.

Validity

The threats to validity which were considered and controlled for included: history, maturation, instrumentation, selection bias, mortality and subject-experimenter effects.

In an effort to control for the effects of history and maturation which may happen between the intervention and the measurement of outcomes, the education sessions were scheduled no greater than two weeks from the expected delivery date and the measurement of outcomes occurred no greater than 24 hours following the birth of the infant. This served to limit contact with others who may have had access to the education. In addition, all patient rooms in the obstetrical unit at RDRHC are private which also assisted in limiting the contact between participants.

Instrumentation effects were minimized by an established inter-rater reliability of 95% in the use of the NCATS tool,and videotaping of all interactions for later scoring.

Selection bias was minimized through the use of random assignment to groups, however there was a high mortality rate with the elimination of parent-infant dyads as a result of complications. The 10% drop out rate originally included in the determination of sample size was not adequate. It is not known if this was an unusually high complication rate unique to the RDRHC or the norm.

Subject-experimenter effects may have influenced the results of this study. In an effort to minimize this, the information and consent form were generic with regard to the specific goal of the study. Educational sessions were videotaped to ensure that all participants in the treatment group received the same information, and all assessments were videotaped and scored by a research assistant, certified in the use of the NCAST tools. The rater had no indication of which dyads were part of the treatment or control group.

Data Analysis

Twenty-nine mother-infant pairs took part in this study. There were 14 pairs in the treatment group and 15 pairs in the control group. Treatment consisted of attendance at a one hour educational session on infant states, behaviours and communication cues. Participants of both groups were assessed using the NCATS within 24 hours following the birth of each infant. Each mother was asked to teach her infant to look at a rattle. The interaction was videotaped and scored using the NCATS. An inter-rater reliability of 95% was attained by two observers.

Initially the sample size was to consist of 70 dyads to achieve a power of .80. Although 70 dyads did register and participate in the study, complications of labour, delivery and birth, reduced the sample to 29 viable dyads within the time frame selected for the completion of the study. Reasons for participant drop out included; prematurity, small for gestational age, low APGARS, difficult feeders, septicemia, admission to Special Care Nursery for observation, respiratory difficulties, birth anomalies and disorders and Cesarean section. The 10% allowed for sample mortality was not adequate, as the complication rate for primagravidas at RDRHC proved to be much greater.

Data were collected on each of the categories on the NCATS as well as on age, education, perceived social support, pain, energy level and score achieved on the DLC. The following symbols were used for ease in data reporting:

SC = sensitivity to cues
RD = response to distress
SE = social emotional growth fostering
CG = cognitive growth fostering
T = caregiver total scores
CC = clarity of cues
RC = responsiveness to caregiver
CT = child total
OT = overall total (caregiver + child)
CS = contingency sensitivity to cues
CR = contingency response to distress
CSE = contingency social emotional growth fostering
CCG = contingency cognitive growth fostering
CCT = contingency caregiver total
CRC = contingency responsiveness to caregiver
COT = contingency overall total
AGE = age of each participant mother

ED = education level of each mother where; 1 = junior high, 2 = high school, 3 = college, 4 = university

SS = social support where 0 = no perceived social support, 1 = adequate social support, 2 = abundant social support.

PAIN = reported pain level at time of observation where 1 = no pain and 5 = great pain.

ENG = energy level reported at time of observation where 1 = low energy and 5 = high energy.

DLC = score on the Difficult Life Circumstances rating scale.

Research Question

"Is there a significant difference in the quality of interaction within the first 24 hours following birth that occurs between mother-infant dyads who have had Infant Communication Education prior to the birth of the infant and mother-infant dyads who have not had this education?."

Ho: $X_c = X_e$

Hi: $X_c < X_e$

An alpha level of .05 was set to reduce the possibility of making a Type I error and rejecting a true null hypothesis.

Sample Description of Background Variables

Both the treatment and the control groups were similar in terms of background variables. All participants were between 18 and 40 years of age, with a mean age of 27.5 years and all had a minimum of High School education. There was little variation between the mothers of either group. See Appendix H for frequency distribution, and a stem and leaf display as a description of the sample. Information was collected on age, education level, perceived social support, pain and energy level at the time of the assessment and rating on the DLC. Table 1 provides a sample description of means and standard deviations.

Table 1
Sample Description of Background Variables for the Control and Treatment group

	Control group		Treatment group	
	Mean	SD	Mean	SD
Age	26.73	4.86	28.36	4.57
Ed.	2.60	.74	2.86	.77
Ss.	.87	.35	1.0	0.0
Pain	2.53	.74	2.07	1.14
Energy	3.00	.66	2.57	1.02
DLC	1.40	1.50	1.43	2.17

Independent t-tests Results: the Effect of Prenatal Education on NCATS Scores

Box plots and stem and leaf displays on the outcome variables indicate no outliers and a moderate degree of overlap between the treatment and control group on all items. (See Appendix I.) However each outcome variable has a higher mean for the treatment group as opposed to the control group which would suggest that the independent variable did effect the results positively. T-tests were completed on the effect of the independent variable on each outcome measurement and are reported in Table 2.

Table 2
t-test Results
Effect of Prenatal Education on NCATS Scores
n = 29, DF = 27

Teaching Scales	t-test	one-tailed p
Caregiver scores		
Sensitivity to cues	1.48	.08
Response to distress	.97	.17
Social emotional growth	1.46	.07
Cognitive growth	1.50	.08
Mother Total Score	1.45	.08
Child scores		
Clarity of cues	1.60	.06
Responsiveness to parent	1.11	.14
Child Total Score	1.54	.07
Overall total	**1.69**	**.05**
Contingency scores		
Sensitivity to cues	**1.93**	**.03**
Response to distress	.85	.20
Social emotional growth	**1.93**	**.03**
Cognitive growth	.51	.30
Caregiver contingency total	1.52	.07
Child responsiveness to caregiver	1.08	.15
Contingency total	1.60	.06

The results of each t-test was based on a one tailed assumption for a directional hypothesis, assuming that the education would make a difference.

Significance of t-test Findings

Overall total scores

This category had a p = .05 level of significance. As the internal consistencies of total scores is higher than those for the individual subscale scores, this finding would indeed suggest the education delivered in the prenatal period did have a positive effect on the quality of interaction that occurred between the mother-infant dyad within the first 24 hours following birth.

Contingency scores

The driving force behind achieving synchrony in mother-infant interaction is contingency behaviour. The contingency items in the NCATS score the mother and infant on their response to one another. It is this response that reinforces behaviour patterns and is a demonstration of mother-infant interaction. It was encouraging that two of the contingency categories showed a significant education effect on the interaction that occurred between the dyad. These two categories were: Contingency Sensitivity to Cues and Contingency Emotional Growth Fostering behaviours. Although the sample size has decreased the power of this study, the results are encouraging.

Pearson Correlations between Caregiver and Child Total Scores

Correlations were calculated between all outcome variables and sample descriptors (See Appendix J). As the quality of interaction between the dyad is dependent upon the characteristics of each participant, the relationship between caregiver total scores and child total scores was of particular interest. Table 3 represents the significant findings for the control group and Table 4 for the treatment group.

Table 3
Control Group Correlations between Caregiver Scores, Contingency Scores and Child Scores
n = 15; (* = p < .05; ! = p < .01)

	T	CC	RC	CT	OT
Caregiver scores					
Sensitivity to cues	.86!	-	.57*	.51*	.84!
Response to distress	.76!	-	-	-	.66*
Social emotional	.68*	.52*	-	.49*	.70*
Cognitive growth	.88!	-	.57*	.55*	.86!
Total	1.0	-	.57*	.55*	.95!
Contingency scores					
Sensitivity to cues	.87!	.47*	.63*	-	.88!
Response to distress	.76!	-	-	-	.68*
Social emotional	.48*	-	.49*	.51*	.55*
Cognitive growth	.68*	.61*	-	.58*	.72!
Caregiver totals	.88!	.52*	.58*	.62*	.89!
Contingency total	.82!	.65*	.79!	.80!	.91!
Overall total scores	.54	.62*	.76!	.77	1.0

T = Caregiver total CC = Childs' clarity of cues
RC = Childs' responsiveness to caregiver
CT = Child total OT = Overall total

The moderate to high correlation between the caregiver total scores, overall total scores and each of the contingency variables is worthy of note. In addition the correlation of the childs' clarity of cues, responsiveness to the caregiver and child total scores with the caregiver and contingency scores provides some support for the theory that the characteristics of each

participant play a role in the quality of interaction that occurs between the dyad.

Table 4

Treatment Group Correlations between Caregiver Scores, Contingency Scores and Child Scores n = 14; (* = p <.05; ! = p <.01)

	T	CC	RC	CT	OT
Caregiver scores					
Sensitivity to cues	.92!	-	-	-	.84!
Response to distress	.57*	-	-	-	.89!
Social emotional growth	.93!	-	.48*	-	.51*
Cognitive growth	.98!	-	.47*	-	.78!
Total	1.00!	-	.48*	-	.95!
Contingency scores					
Sensitivity to cues	.77!	-	-	-	.50*
Response to distress	.58*	-	-	.54*	.84!
Social emotional growth	.80!	-	.67*	-	.89!
Cognitive growth	.94!	-	-	-	.92!
Caregiver total	.97!	-	-	-	.62*
Contingency total	.95!	.46*	.70!	.60*	.97!
Overall total scores	.95!	.56*	.70*	.66*	1.00

T = Caregiver total CC = Childs' clarity of cues
RC = Childs' responsiveness to caregiver
CT - Child total OT = Overall totals

Of particular interest is the similar relationship between caregiver total scores and overall total scores with each of the contingency items in the treatment group as well as in the control group. The lack of or weak correlation between the childs' clarity of cues and child total scores with the caregivers' total scores and contingency items is also worthy of note with this group. An additional relationship not represented in this table is the strong correlation between the childs' clarity of cues and the childs' responsiveness to the caregiver (r = .80, p = .000).

Comparison of Means and Standard Deviations with the NCAST Data Base Scores

A comparison of the NCAST data base means and standard deviations for the use of the NCATS with first time mothers and the findings of this study are listed in Table 5.

Table 5
Comparison of Means and Standard Deviations between NCAST Data Base Scores, Control and Treatment Group Scores

	NCAST n=1019		Control n=15		Treatment n=14	
Teaching scales	Mean	SD	Mean	SD	Mean	SD
Caregiver						
SC	9.31	1.67	7.80	2.62	9.07	1.94
RD	10.88	1.56	9.87	1.36	10.29	.91
SE	9.19	1.71	7.93	1.90	8.93	1.64
CG	12.78	3.50	7.47	3.82	9.93	5.20
T	41.46	8.44	33.53	8.59	38.29	9.02
Child						
CC	8.03	1.52	5.40	2.34	6.71	2.05
RC	7.58	3.17	5.07	2.05	5.86	1.75
CT	15.61	4.30	10.40	3.96	12.57	3.61
Overall total	57.07	9.09	43.87	11.28	50.86	10.97
Contingency						
Caregiver	16.34	3.68	11.80	4.40	14.14	3.94
Child	6.88	2.95	4.35	2.00	5.14	1.70

SC = sensitivity to cues RD = response to distress
SE = social emotional growth fostering
CG = cognitive growth fostering
T = caregiver total CC = child clarity of cues
RC = child responsiveness to caregiver
CT = child total

It is interesting that the caregiver scores of the treatment group in this study more closely resemble the scores for the NCAST data base than do the scores of the control group.

Discussion

The t-test data set indicates that the education provided in the prenatal period did effect the quality of interaction that occurred between the mother-infant dyad. This finding supports the theory that altering the characteristics of the parent, in this case increasing competence through knowledge attainment, will effect the quality of interaction between the parent and child (Anderson, 1981; Aydlett, 1993; Barnard et al., 1987; Barnard, Morrisett, & Spieker, 1993; Dickie & gerber, 1980, Dormir, Strauss, & Clarke, 1988, Poley-Strobel & Beckman, 1987; Riesch & Munns, 1984, Sullivan, 1991, Tedder, 1991, White, Traut & Nelson, 1988; Ziolko, 1991). It also lends support to Anderson's (1981) study which indicates that teaching without demonstration with the infant could be effective. For indeed this intervention occurred prior to the birth of the infant.

As there was a moderate correlation (r =.48 to r = .57) between the infants' responsiveness to the caregiver and caregiver total scores in both the treatment and the control group this would lead one to consider the effect of the caregivers' behaviours on the childs' responsiveness and vice versa and lends support to the theory that altering the characteristics of the caregiver or child would influence the quality of interaction that occurs between the dyad (NCAST, 1995).

The high correlation between infants' clarity of cues and responsiveness to the caregiver (r = .80; p = .000) supports previous findings for internal validity with the use of the tool (NCAST, 1995). It was interesting that there was no significant correlation between the infant's clarity of cues and any of the other outcome variables in the treatment group as there was with the control group. This would make one wonder if the control group relied upon behaviour demonstrated by the infant to evoke a response and the treatment group exhibited the behaviour regardless of how clear the infants' cues were, based on knowledge attained.

As caregiver total scores and overall total scores correlated with the childs' clarity of cues and responsiveness to the caregiver as well as all contingency items for both the treatment and control groups at less than the p = .05 significance level, this would support the theory that the achievement of higher caregiver totals does indeed effect the quality of interaction that occurs between the mother-infant dyad (Barnard, 1978; Capuzzi, 1989; Huber, 1991). However it is disappointing that the t-test did not show a significant effect of the teaching

on the caregiver total scores. Factors that may account for this include the small sample size, the timing and content of education sessions, individual learning styles, as well as stress at the time of education delivery and at the time of the assessment.

There was a moderate negative correlation between DLC and cognitive growth fostering ($r = -.501$, $p = .025$) and contingency cognitive growth fostering ($r = -.557$, $p = .025$) in the treatment group. Interestingly, there was no significant correlation between age, education, social support, pain, or energy level with any of the outcome variables for either group as has been found in previous studies (Barnard, 1978; Jones & Lens, 1986; Williams, Williams & Grigg, 1990; Dormir, Strauss & Clarke, 1988; Norbeck, Lindsey & Carrier, 1981). This may be accounted for once again by the small sample size and also by the fact this study consisted of one very brief observation of five minutes or less and was not triangulated with another tool or repeat measure.

The NCAST data base for the NCATS is based on a sample size of 1019 mothers with first born infants. The average age of the mothers was 25.7 years old (range of 18-40 years). The average age of the infants was 15.5 months (range of 1 - 36 months). The average age of mothers in this study was 27.5 years (range of 18-40 years). All infants were 24 hours old. The young age of the infants in this study may account for the variation in means and standard deviations on the NCATS. In addition, the mother-infant dyads in the NCAST data base had on average 15.5 months to learn, adapt, and develop a level of parental competence. In previous studies it has been found that parental competence has been achieved through the initial adaptation period (Sander, 1962) and through proximity and familiarity (Blehar, Lieberman & Ainsworth, 1977: Cohen & Beckwith, 1979; White, Traut & Nelson, 1988) with the infant. It is interesting that the scores of the treatment group in this study more closely resemble the scores from the NCAST data base than do the scores of the control group. These findings suggest that perhaps the intervention assisted the mother-infant dyads in the treatment group to achieve a similar level of quality interactions as those mother-infant dyads who had between 1-36 months to achieve this level of synchrony. In addition the age of the infant in the NCAST data base enabled the infant to have developed clearer cues and responses which would account for the higher overall scores. This study provides a beginning data base for the newborn infant age group.

Summary

Results from this data set show that infant communication education delivered in the prenatal period positively effects the quality of interaction that occurs between a mother-infant dyad during the first 24 hours following birth as measured by the overall totals on the Nursing Child Assessment Teaching Scale, as well as the Contingency responses in the Sensitivity to cues, and Social emotional growth fostering categories. These findings are supported by the correlations between caregiver total scores and overall total scores with the childs' clarity of cues, responsiveness to the caregiver, and the contingency items of the NCATS. In addition a comparison of scores with the NCAST data base available suggests that the teaching intervention may lead to the attainment of earlier parental competence.

Limitations

As the target population selected for this study was narrow, the results are generalizable to only first time mothers delivering their infants at RDRHC between the months of April-July, 1995. This study looks only at the effect of prenatal education on infant communication in the immediate post-delivery phase. It does not indicate retention of information and resultant changes in behaviour following the initial adaptation period for the development of competency. The small sample size may have also contributed to the absent correlation between age, education, social support, pain and energy level of the mother and the outcome variables.

Recommendations for Future Research

As the sample size of this study was small, a repeat study with a larger sample is recommended to determine if the results would continue to be positive. In addition, research which looks at increasing the data base available for infants from birth to one month of age would add an additional dimension to the use of the NCATS and would fill a gap in this area of research.

Although parent descriptor variables were used to correlate findings on the outcome variables, other variables such as sex of the infant and the parent's perceptions of the child were not included in the data collection or analysis.

A future study which would look at the achievement of competency as the result of prenatal infant communication education may provide additional support for the implementation of this early intervention and support the comparative findings between this study and the NCAST data base for the NCATS. A follow up assessment of both groups at three weeks of age and again at two and one half months of age would have enabled this to occur, however the ethics of withholding education that could benefit the control group dyads was an issue to be considered.

Research that continues to build upon the child health assessment model would be beneficial in promoting optimum growth and development of the child, caregiver and family as well as adding to family nursing research. For instance, this study looked at altering only one characteristic of the caregiver and the impact that would have on the interaction that occurred between the mother and infant. Would the same effect be evident with fathers, nurses, or day care workers?

Determining the effect of altering other characteristics of either the caregiver, child or environment would be beneficial. An example might be: If prenatal education on infant states, cues and behaviours effects the quality of interaction that occurs between the parent and child, will it also effect the temperament of the child? Is there a relationship between infant temperament and the quality of interaction that occurs? What if any is the impact of changing the quality of interaction between a caregiver and child on the environment? Does altering the environment alone impact the quality of interaction that occurs between the dyad?

As with any research, one question leads to many others. The quest for knowledge and the desire to apply this knowledge to practice will lead nursing into the future.

Implications for Nursing Practice

Traditionally, prenatal education has focused on the labour and delivery process. Very little information has been provided on infant communication at this time. The mothers who attended the educational sessions prenatally were excited and enthusiastic about the information offered and felt it was an important part of prenatal education. They were attentive and interested in learning about the infant's behavioural and communication abilities. Incorporating information on infant states, behaviours, and cues into prenatal education sessions provides the caregiver with an introduction on how to promote quality interactions with the child. Reinforcement of this information postnatally during community health visits and well-baby clinics would serve to facilitate and perhaps expedite the achievement of mother-infant synchrony.

The Keys to CaregivinG program (Sumner, 1990) provides a ready tool which the nurse clinician may use in his or her teaching. In addition the NCATS itself may serve as a valuable tool that the nurse may use to initially assess the interaction between the caregiver-infant dyad and later discuss the findings with the caregiver with an aim toward goal attainment. The NCATS provides a ready outcome measurement when the dyad is re-tested following a teaching intervention. As nurses continually strive to determine the effectiveness of an intervention, this tool provides valuable feedback to guide practice.

Conclusion

The quality of interaction that occurs between the primary caregiver and infant provides the foundation for cognitive and social development of the child. The quality of interaction between the parent-child dyad is influenced by the characteristics of the child, parent, and environment. When the parent is able to respond to the communication cues of the infant and the infant is in turn able to respond to the caregiver, parent-infant synchrony develops which promotes optimum cognitive, social and linguistic development. Through education and support, the nurse is able to assist in the facilitation of parental competence in interpreting the responses and behavioural cues of the infant. Shortened hospital stay and restricted community resources limit the opportunity for education following the birth of the baby, however.

Results of this study provide an outcome measurement for a specific nursing intervention which could have far reaching effects towards minimizing the consequences of ineffective parent-infant interaction such as child abuse, failure to thrive, neglect, and cognitive, linguistic, and social delay. Prenatal teaching about infant communication provides a health promotion strategy easily used within the constraints of our present health care economy and it is the recommendation of this study that this information be incorporated in prenatal classes and/or pre-admission clinics.

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APPENDIX A

NCAST TEACHING SCALE

Birth to Three Years Only

Information applies to parent only

Mother's Ethnic Heritage (See back page)

Marital/Partner Status ☐ Married ☐ Single

Person Observed ____ Age ____ Educ.

☐ Mother ☐ Father

☐ Other ____

Major Caregiver ☐ Yes ☐ No

Name of Task ____

Length of Time Teaching (*minutes*)

1 or Less 2 3 4 5 6 or More

Setting

☐ Home

☐ Clinic

☐ Other ____

Were Others Present?

☐ Yes

☐ No

If yes, specify ____

Child's Name ____

Child's Age (*in months*) ____

Child's Sex ____

Child's Birth Order (*circle*)

1 2 3 4 5 or More

Child's State at Beginning of Teaching (*circle*)

Quiet Sleep Active Sleep Drowsy

Quiet Alert Active Alert Crying

I. SENSITIVITY TO CUES

	YES	NO
1. Caregiver positions child so child is safely supported.		
2. Caregiver positions child so that child can reach and handle teaching materials.		
3. Caregiver gets the child's attention before beginning the task, at the start of the teaching interaction.		
4. Caregiver gives instruction only when child is attentive (90% of the time).		
5. Caregiver allows child to explore the task material for at least five seconds before giving the first task related instruction.		
6. Caregiver positions child so that it is possible for them to have eye-to-eye contact with one another during the majority of the teaching episode (60%).		
7. Caregiver pauses when the child initiates behaviors during the teaching episode.		
8. Caregiver praises child's successes or partial successes.		
9. Caregiver asks for no more than three performances when child is successful at completing the task.		
10. Caregiver changes position of child and/or materials after unsuccessful attempt by the child to do the task.		
11. Caregiver avoids physically forcing the child to complete the task.		
TOTAL YES ANSWERS		

II. RESPONSE TO CHILD'S DISTRESS

☐ Yes ☐ No **(Potent disengagement cues observed)**

12. Caregiver stops the teaching episode.		
13. Caregiver makes positive, sympathetic, or soothing verbalization.		
14. Caregiver changes voice volume to softer or higher pitch, does not yell.		
15. Caregiver rearranges the child's position and/or task materials.		
16. Caregiver makes soothing non-verbal response, e.g. pat, touch, rock, caress, kiss.		
17. Caregiver diverts the child's attention by playing games, introduces a new toy.		
18. Caregiver avoids making negative comments to the child.		
19. Caregiver avoids yelling at the child.		
20. Caregiver avoids using abrupt movements or rough handling.		
21. Caregiver avoids slapping, hitting or spanking.		
22. Caregiver avoids making negative comments to home visitor about the child.		
TOTAL YES ANSWERS		

III. SOCIAL-EMOTIONAL GROWTH FOSTERING

23. Caregiver's body posture is relaxed during the teaching episode (90%).		
24. Caregiver positions self face-to-face with the child during the teaching interaction (60%).		
25. Caregiver laughs or smiles at child during the teaching interaction.		
26. Caregiver gently pats, caresses, strokes, hugs, or kisses child during episode.		
27. Caregiver smiles, or touches child within five seconds after the child smiles or vocalizes.		
28. Caregiver praises child's efforts or behaviors broadly (in general) at least once during the episode.		
29. Caregiver makes cheerleading type statements to the child during the teaching interaction.		
30. Caregiver avoids vocalizing to the child at the same time the child is vocalizing.		
31. Caregiver avoids making general negative or uncomplimentary remarks about the child.		
32. Caregiver avoids yelling at the child during the episode.		
33. Caregiver avoids making critical or negative comments about the child's task performance.		
TOTAL YES ANSWERS		

IV. COGNITIVE GROWTH FOSTERING

34. Caregiver provides an immediate environment which is free from distractions from animate sources (sibs, pets, other people, T.V.).		
35. Caregiver focuses attention and child's attention on the task during most of the teaching (60%).		
36. After caregiver gives instructions, at least five seconds is allowed for the child to attempt the task before caregiver intervenes again.		
37. Caregiver allows non-task manipulation of the task materials after the original presentation.		
38. Caregiver describes perceptual qualities of the task materials to the child.		
39. Caregiver uses at least two different sentences or phrases to describe the task to the child.		
40. Caregiver uses explanatory verbal style more than imperative style in teaching the child.		
41. Caregiver's directions are stated in clear, unambiguous language (i.e. ambiguous = "turn"; unambiguous = "turn the knob toward me").		
42. Caregiver uses both verbal description and modeling simultaneously in teaching any part of the task.		
43. Caregiver encourages and/or allows the child to perform the task at least once before intruding in on the use of the task materials.		
44. Caregiver verbally praises child after child has performed better or more successfully than the last attempt.		
45. Caregiver smiles and/or nods at the child after child performs better or more successfully than the last attempt.		
46. Caregiver responds to the child's vocalizations with a verbal response.		
47. Caregiver uses both verbal and non-verbal instruction in teaching the child.		
48. Caregiver uses the teaching loop at least once.		
49. Caregiver signals completion of task to child verbally or nonverbally.		
50. Caregiver spends no more than five minutes and not less than one minute in teaching the child the task.		
TOTAL YES ANSWERS		

V. CLARITY OF CUES

	YES	NO
51. Child is awake.		
52. Child widens eyes and/or shows postural attention to task situation.		
53. Child changes intensity or amount of motor activity when task material is presented.		
54. Child's movements are clearly directed toward the task *or* task material *or* away from the task material (not diffuse).		
55. Child makes clearly recognizable arm movements during the teaching episode (clapping, reaching, waving, pounding, pointing, pushing away).		
56. Child vocalizes while looking at the task materials.		
57. Child smiles or laughs during the episode.		
58. Child grimaces or frowns during the teaching episode.		
59. Child displays potent disengagement cues during the teaching interaction.		
60. Child displays subtle disengagement cues during the teaching interaction.		
TOTAL YES ANSWERS		

VI. RESPONSIVENESS TO CAREGIVER

61. Child gazes at caregiver's face or task materials after the caregiver has shown verbal or non-verbal alerting behavior.		
62. Child attempts to engage caregiver in eye-to-eye contact.		
63. The child looks at the caregiver's face or eyes when caregiver attempts to establish eye-to-eye contact.		
64. Child vocalizes or babbles within five seconds after caregiver's verbalization.		
65. Child vocalizes or babbles within five seconds after caregiver's gesturing, touching or changing his/her facial expression.		
66. Child smiles at caregiver within five seconds after caregiver's verbalization.		
67. Child smiles at caregiver within five seconds after caregiver's gesture, touch, or facial expression changes.		
68. When caregiver moves closer than eight inches from the child's face the child shows some subtle and/or potent disengagement cues.		
69. Child shows subtle and/or potent disengagement cues within five seconds after caregiver changes facial expression or body movement.		
70. Child shows subtle and/or potent disengagement cues within five seconds after caregiver's verbalization.		
71. Child shows potent and/or subtle disengagement cues when caregiver attempts to intrude physically in the child's use of the task materials.		
72. Child physically resists or responds aggressively when caregiver attempts to intrude physically in child's use of the task materials.		
73. The child stops displaying potent disengagement cues within 15 seconds after caregiver's soothing attempts.		
TOTAL YES ANSWERS		

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To use this scale for research or clinical practice requires training. For more information write or call:

NCAST Programs
University of Washington
Box 357920
Seattle, WA 98195-7920
Phone (206) 543-8528 FAX (206) 685-3284

Enter the total yes answers from each subscale and compare it with the possible score:

	SUBSCALE Items		CONTINGENCY Items	
	Possible	Actual	Possible	Actual
SENSITIVITY TO CUES	11		5	
RESPONSE TO DISTRESS	11		6	
SOCIAL-EMOTIONAL GROWTH FOSTERING	11		3	
COGNITIVE GROWTH FOSTERING	17		6	
CAREGIVER TOTAL	50		20	
CLARITY OF CUES	10		0	
RESPONSIVENESS TO CAREGIVER	13		12	
CHILD TOTAL	23		12	
CAREGIVER/CHILD TOTAL	73		32	

Check the potent disengagement cues observed during the teaching interaction.

- ___ Back arching
- ___ Choking
- ___ Coughing
- ___ Crawling away
- ___ Cry face
- ___ Crying
- ___ Fussing
- ___ Halt hand
- ___ Lateral head shake
- ___ Maximal lateral gaze aversion
- ___ Overhand beating movements
- ___ Pale/red skin
- ___ Pulling away
- ___ Pushing away
- ___ Saying "no"
- ___ Spitting
- ___ Spitting up
- ___ Tray pound
- ___ Vomiting
- ___ Walking Away
- ___ Whining
- ___ Withdraw from alert to sleep state

Ethnic Heritage. Place a checkmark next to the mother's ethnic heritage and write in her specific group identity.

- ___ African-American
- ___ Asian Indian or A.I.- American
- ___ Chinese or Chinese-American
- ___ Filipino or Filipino-American
- ___ Japanese or Japanese-American
- ___ Korean or Korean-American
- ___ Pacific Islander or P.I.- American
- ___ Vietnamese or Vietnamese-American
- ___ Other Asian
- ___ Cuban or Cuban-American
- ___ Mexican, Chicano, or Mex. American
- ___ Puerto Rican
- ___ Other Hispanic/Latin
- ___ Native American or Alaskan Native
- ___ White/Caucasian (non-Hispanic)
- ___ Other

Specific group identity:_____

Clinical Notes:

Date of Observation _____

Recorder's Signature _____

APPENDIX B

Infant Communication Education Outline

Title of program: Is my Baby Trying to Tell me Something?

Length: 45 minutes

Method: Lecture/Video
Handouts

Content based on NCAST Keys to CaregivinG program (Sumner, 1990).

Outline

I. Introduction
The Barnard Model will be introduced and how the characteristics of the caregiver, infant and environment influence the interaction that occurs between caregiver and child and forms the foundation for development.

II. Infant States

III. State Modulation

IV. Infant Behaviour

V. Engagement/Disengagement Cues

VI. Summary

VII. Distribution of Keys to CaregivinG parent handouts (5)

APPENDIX C

April 22, 1995

Carol Murray
Director of Nursing
Red Deer Regional Hospital Center

Dear Carol Murray:

I am writing to request permission to conduct a research study on mother-infant interactions in the Obstetrical unit at Red Deer Regional Hospital Center. I have enclosed a copy of my research proposal for your review but will summarize it briefly here. This study is in partial fulfillment of the Masters of Nursing degree at the University of Alberta and has met with their approval.

Should you provide approval: a sample of 75 first time mothers would be recruited through the Obstetrical pre-admission clinic during the months of June-Oct.,1995 to participate in this study. Upon written consent, participants would be randomly assigned to a control group or an intervention group. The intervention group would receive education on infant communication prior to admission to the hospital. The control group will receive no education prior to their admission to the hospital, but will have access to this information prior to discharge. The effect of the intervention will be measured through an assessment of a brief five minute interaction between the mother and infant within 24 hours of birth and prior to discharge from the hospital. This interaction would be videotaped. Strict confidentiality will be adhered to.

The assistance of the pre-admission program coordinator in determining candidates who meet the selection criteria of the study would be greatly appreciated. Although I do not require nursing staff assistance in either the intervention or data collection, their support of this study would be most helpful.

The knowledge gained from this study may influence the educational interventions that maternal-child nurses utilize with their patients both in the community and the institution. On a larger perspective, it may influence child outcomes that are in direct relation to the interactions that occur between mother and child

such as maximizing potential and minimizing the risk of child abuse, neglect and failure to thrive.

I am quite excited about initiating this study and would be very willing to meet with you to discuss it in further detail should you so wish.

I am hoping to begin the study in June of 1995. Your response prior to May 15, 1995 would be greatly appreciated.
Thank you for your time and consideration. I look forward to your reply.

Sincerely

Deborah Leitch
Masters of Nursing Candidate
University of Alberta

Home Phone: 746-5326
Work Phone: 343-4826

APPENDIX C

Red Deer Regional Hospital Centre

3942 - 50A Avenue Red Deer, Alberta T4N 4E7

Telephone - (403) 343-4422
Facsimile - (403) 343-4433

Mailing Address
P.O. Bag 5030
Red Deer, Alberta
T4N 6R2

April 25, 1995

Joint Ethics Review Committee
Faculty of Nursing
University of Alberta
Walter C. Mackenzie Health Sciences Centre
8440 - 112 Street
Edmonton, Alberta
T6G 2B7

To: ERC Members:

I am writing in support of the research project, "Mother-Infant Interactions: Achieving Synchrony", to be completed by Deborah B. Leitch at the Red Deer Regional Hospital Center between the months of June and October of 1995.

I feel that the information to be gained from this study will be beneficial to the profession of nursing, the facility and the community as it will enable an outcome measurement for a specific nursing intervention aimed to improve parent-child relationships.

I support Debbie in the initiation of this research and look forward to the results of her study.

Yours sincerely,

Carol Murray,
Director of Nursing/Quality Management

/mjw

OWNERS & OPERATORS OF:

Red Deer General Hospital
3942 - 50A Avenue
343-4422

Dr. Richard Parsons Auxiliary Hospital
3929 - 52 Avenue
343-4422

Valley Park Manor Nursing Home
5505 - 60 Avenue
343-4722

Red Deer Nursing Home
4706 - 30 Street
342-4458

Westpark Nursing Home
5115 - 41 St
343-4639

45 189

APPENDIX D

DEMOGRAPHICS AND CLIENT INFORMATION

CLIENT ID # _____ GROUP _____

Please answer the following questions:

1. What is your Date of Birth? _____

2. What is the highest level of education that you have completed?
   a. Junior High School
   b. Senior High School
   c. Community College
   d. University

3. Do you presently have a spouse or partner?

   _____Yes _____No

4. What social support do you have available to you?

Please circle the number from 1-5 that best reflects your answer to the following questions.

5. What is your present level of pain or discomfort?

   (No pain) 1...2...3...4...5 (Great pain)

6. What is your present level of energy?

   (Very tired) 1...2...3...4...5 (Lots of energy)

Date: _____

DLC

DIFFICULT LIFE CIRCUMSTANCES

APPENDIX E

Name: _____ Marital Status: _____ Age: _____ Race: _____ Sex: _____

Education: _____ Occupation: _____ Number of Children: _____ under 5 yrs: _____ 5-18 yrs

Below are a list of problems. You must decide if a particular one is a problem for you. Check which ones apply. If any of these questions make you uncomfortable, you don't have to answer. We can help you the most by knowing the difficult circumstances you face in your life.

	Yes	No
1. Are you having regular arguments or conflicts with your present partner/steady boy/girlfriend?		
2. Are you having some sort of problem with any one of your former spouses/partners?		
3. Is your partner in jail?		
4. Is your partner away from the home more than half of the time because of a job or other reason?		
5. Do you have long-term debts other than a house mortgage (2 years or more)?		
6. Do you have problems with your credit rating—do you get hassled pretty often by bill collectors or collection agencies?		
7. Have you been looking for a job and have not been able to find one? (score as a no if mother is employed or not looking)		
8. Does your work interfere with your family life? (no if not working or no family)		
9. Does your partner's work interfere with your family life? (no if no partner)		
10. Do you have trouble with your landlord? (no if own home)		
11. Do you have trouble finding a place to live that is suitable and you can afford?		
12. Do you feel that you do not have enough privacy?		
13. Do you have people living with you—relatives or friends —that you wish weren't there?		
14. Do you have neighbors who are really unfriendly or giving you problems?		
15. Do you or someone in your household have a longterm illness?		

	Yes	No
16. Have you had frequent minor illnesses in the past year?		
17. Do you have a problem with alcohol or drugs (prescription or street)?		
18. Does your partner have a problem with alcohol or drugs?		
19. Does someone in your household other than you or your partner have a problem with alcohol or drugs?		
20. Have you been the victim of a crime in the past year?		
21. Has your current partner ever physically abused you? (no if no partner)		
22. Has your current partner ever verbally or emotionally abused you (put-downs, or saying things that make you feel really bad or worthless)?		
23. Is someone other than your present partner presently abusing you sexually, physically, or emotionally?		
24. Have you been hospitalized in the past year for any reason—accident or illness?		
25. Are you without a phone at your present home or apartment?		
26. Is one of your children being abused sexually, emotionally, or physically (by anyone)?		
27. Is one of your children experiencing learning problems or other school problems that require you to consult with the teacher or other school officials?		
28. Has one of your children been having serious emotional or behavioral problems at home (e.g., Repeated nightmares, repeated tantrums, repeated major aggressive outbursts, etc.)?		

TOTAL YES ANSWERS _____

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A manual is required to use this scale For more information call NCAST PROGRAMS (206) 543-8528.

APPENDIX F

Letter of Information

June 1, 1995

Dear_____

My name is Deborah Leitch. I am a graduate student in the Faculty of Nursing at the University of Alberta. I am conducting a research study on the communication between a new, first time mother and her baby.

There will be two groups in the study. Group 1 must attend a 45 minute class before the baby is born. Group 2 may attend the class after the birth of the baby. I will visit you in the hospital within the first 24 hours after the birth of your baby. I will videotape the two of you together. The videotaped session will take about five minutes. Only my research supersiors and me will have access to the videotapes.

Taking part in this study may provide you with helpful tips and ideas that will assist you in caring for your new baby. It may help you to understand what your baby is telling you. The results may influence the teaching given to new mothers by nurses. There is no fee paid to you for taking part in this study.

Any behaviour that would show that you may need assistance in parenting would be discussed with you. Help is available, and the right contacts can be made for you.

Should you agree to participate, I will ask you to sign a consent form acknowledging the above. Your participation is voluntary. Refusal to participate will involve no difference in treatment. You and your baby are free to leave the study whenever you please. Your name will be kept secret. General findings from the study may be published. The only identifying factor to be used in any sharing of data will be an identification number. This study has the approval of the Director of Nursing at Red Deer Regional Hospital Centre and the University of Alberta Faculty of Graduate Studies.

Information related to you and your child, is available to you. The results of the study will also be sent to you, if you wish. If any information from this study is

felt to be useful for a future study, the necessary ethical approval processes will be followed.

Thank you for taking the time to think about taking part in this study. I would be happy to answer any questions that you may have. If you would like to discuss this study further, please feel free to contact me at (403) 343-4826. Or, you may phone my Research Supervisor, Dr. M. Ruth Elliott at (403) 492-6241.

I look forward to meeting you on

_____

at your pre-admission clinic appointment.

Sincerely

Deborah Leitch
Masters of Nursing student
Faculty of Nursing
University of Alberta

APPENDIX G

Consent Form

Project Title: Mother-Infant Interaction: Achieving Synchrony

Researcher: Deborah Leitch, RN Phone 343-4826

RR #3, Eckville, Alta.

Purpose:

The purpose of this study is to learn about mother-infant communication. The goal of the study is to determine the effect of a teaching session on the communication that occurs between a new mother and baby during the first twenty-four hours after birth.

Procedure:

If you choose to take part in this study you will be assigned to one of two groups; a control group and a treatment group. If you are assigned to the treatment group, you will need to attend a 45 minute education class before your baby is born. If you are assigned to the control group, you will not need to attend this education session before your baby is born, but you will be able to attend the session after your baby is born. Regardless of which group you are in, you and your baby will be videotaped for about five minutes within the first 24 hours after your baby is born. The videotapes are kept confidential and only myself and members of my research committee will have access to the tapes. You will also be asked to complete a brief form about your present life circumstances. No names will be used to identify participants in the study. The name, address, and consent forms of all participants are kept in a locked cabinet in my office for at least seven years after the study is completed. This is the requirement for any research study. Results from this study may be published or presented at conferences. You will receive a copy of the report if you so wish.

You are free to take part in the study. You may choose to leave at any time. You may ask that any information that you shared be deleted from the study. There is no

penalty to your withdrawal from the study. You may withdraw by contacting me, or leaving a message on the maternity unit (403) 434-4525. There may be no direct benefit to you for taking part in this study and there is no financial payment for your participation. You may gain knowledge about how you and your baby communicate. The results of the study may provide nurses with information that will help them to assist new mothers in learning about their babies. The risk involved in this study is that should any information surface that would show that your child is at risk, I will discuss my concerns with you. I would then request a referral to a Community Health agency to help you with the needed skills.

Consent:

I acknowledge that the above research procedures have been explained to me. My questions have been answered to my satisfaction. In addition, I know that I may contact the person named below whenever I have other questions. I understand the benefits and risks of this study. I am assured that the records related to this study will be kept confidential. I understand that I am free to withdraw from the study at any time. I further understand that if I do not participate in the study or withdraw, my health care services will not change. Any information that could change my decision to take part in this study will be shared with me immediately. I understand that if any information about abuse of someone under 18 years of age is disclosed by me during the study, it will be discussed with me. The researcher will need to report this information fo Family and Social Services. The researcher will also contact the community health nurse and ask her to visit me. This information cannot be kept confidential. I have been given a copy of this form to keep.

If you have any further questions or concerns, you may contact Dr. M. R. Eliiott, (403) 492-6241, my research supervisor, or Carol Murray, the Director of Nursing at RDRHC at (403) 343-4543.

_____ _____

Signature of Participant Date

_____ _____

Signature of Researcher Date

If you wish to receive a summary of the study when it is finished please complete the next section:

Name_____

Address _____

_____

_____

APPENDIX H

SAMPLE DESCRIPTION

1. Frequency Distribution

AGE	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM %
20-25	4	29%	29%	7	47%	47%
26-30	7	50%	79%	5	33%	80%
31-35	1	7%	86%	2	13%	93%
36-40	2	14%	100%	1	6%	99%
	n=14			n=15		

EDUCATION	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM%
Jr. High	0	0%	0%	0	0%	0%
High Sch.	5	36%	36%	8	53%	53%
College	6	43%	79%	5	33%	86%
University	3	21%	100%	2	13%	99%
	n=14			n=15		

SOC.SUPPORT	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM%
0 = nil				2	13%	13%
1 = adequate	14	100%	100%	13	86%	99%
2 = abundant	0			0		
	n=14			n=15		

PAIN	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM%
1 = low	5	36%	36%	1	6%	6%
2	4	29%	65%	6	40%	46%
3	4	29%	94%	7	47%	93%
4	0			1	6%	99%
5 = high	1	7%	100%			
	n=14			n=15		

ENERGY	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM%
1 = low	2	14%	14%	0		
2	4	29%	43%	3	20%	20%
3	5	36%	79%	9	60%	80%
4	3	21%	100%	3	20%	100%
	n=14			n=15		

APPENDIX H

Sample Description

i. Frequency Distribution (continued)

DLC	EXP GROUP	%	CUM%	CONTROL GROUP	%	CUM%
0	6	43%	43%	7	47%	47%
1	3	21%	64%	1	6%	53%
2	2	14%	78%	2	13%	66%
3	1	7%	85%	4	27%	93%
4	0			1	7%	100%
5	1	7%	92%			
6	0					
7	1	7%	100%			
	n=14			n=15		

APPENDIX H

Sample Description

ii. Stem and Leaf Display

AGE

Combined; n = 29		Control; n =15		Treatment; n =14	
Minimum is:	20.00		20.00		21.00
Lower Hinge is:	24.00		23.50		25.00
Median is:	27.00		26.00		28.00
Upper Hinge is:	30.00		30.00		30.00
Maximum is:	37:00		36.00		37.00

2	001	2	00	2	1
2	33	2 H	33	2	
2 H	444455	2	445	2 H	445
2 M	6777	2 M	677	2	7
2	88888	2		2 M	88888
3 H	0001	3 H	001	3 H	0
3	2	3		3	2
3	5	3	5	3	
3	677	3	6	3	77

EDUCATION LEVEL

Combined; n = 29		Control; n = 15		Treatment; n = 14	
Minimum is:	2.00		2.00		2.00
Lower Hinge is:	2.00		2.00		2.00
Median is:	3.00		2.00		3.00
Upper Hinge is:	3.00		3.00		3.00
Maximum is:	4.00		4.00		4.00

2 H	000000000000	2 M	00000000	2 H	00000
2		2		2	
3 H	0000000000	3 H	00000	3 H	000000
3		3		3	
4	00000	4	00	4	000

APPENDIX H

Sample Description

ii. Stem and Leaf Display continued

SOCIAL SUPPORT

Combined; n = 29	Control; n =15	Treatment; n = 14
Minimum is: 0.00	0.00	Variable is constant
Lower Hinge is: 1.00	1.00	
Median is: 1.00	1.00	
Upper Hinge is: 1.00	1.00	
Maximum is: 1.00	1.00	

```
  0   00
  0
  1 H 00000000000000000000000000
```

PAIN

Combined; n = 29	Control; n = 15	Treatment; n = 14
Minimum is: 1.00	1.00	1.00
Lower Hinge is: 2.00	2.00	1.00
Median is: 2.00	3.00	2.00
Upper Hinge is: 3.00	3.00	3.00
Maximum is: 5.00	4.00	5.00

```
    1   00000              1   0              1 H 00000
    2 M 00000000000        2 H 000000         2 M 00000
    3 H 0000000000         3 H 0000000        3 H 000
    4   0                  4   0              4
***OUTSIDE VALUES***
    5   0                                     5   0
```

APPENDIX H

Sample Description

ii. Stem and Leaf Display continued.

ENERGY LEVEL

Combined; n = 29		Control; n = 15	Treatment; n = 14
Minimum is:	1.00	2.00	1.00
Lower Hinge is:	2.00	3.00	2.00
Median is:	3.00	3.00	2.50
Upper Hinge is:	3.00	3.00	3.00
Maximum is:	4.00	4.00	4.00

```
1   00                    2   000          1   00
2 H 00000000              2                2 M 00000
3 H 0000000000000         3 H 000000000    3 H 0000
4   000000                3                4   000
                          4   000
```

DIFFICULT LIFE CIRCUMSTANCES

Combined; n= 29		Control; n = 15	Treatment; n = 14
Minimum is:	0.00	0.00	0.00
Lower Hinge is:	0.00	0.00	0.00
Median is:	1.00	1.00	.50
Upper Hinge is:	3.00	3.00	2.00
Maximum is:	7.00	4.00	7.00

```
0   000000000000000       0   0000000      0 M 0000000
1 M 0000                  1 M 0            1   000
2   000                   2   00           2 H 0
3 H 00000                 3 H 0000         3   0
4   0                     4   0            4
5   0                                      5   0
Outside Value
7   0                                      7   0
```

APPENDIX I

Statistics

i. Descriptive Statistics

TREATMENT GROUP; n = 14

Variables

	SC	RD	SE	CG	T	CC	RC
Min.	5.00	8.00	6.00	0.00	21.00	2.00	4.00
Max.	11.00	11.00	11.00	16.00	49.00	10.00	10.00
Mean	9.07	10.29	8.93	9.93	38.29	6.71	5.86
S.D.	1.94	.91	1.64	5.20	9.02	2.05	1.75

	CT	OT	CS	CR	CSE	CCG	CTT
Min.	6.00	31.00	2.00	3.00	0.00	0.00	6.00
Max.	20.00	69.00	5.00	6.00	3.00	5.00	18.00
Mean	12.57	50.86	4.21	5.29	1.86	2.79	14.14
S.D.	3.61	10.97	.98	.91	1.03	1.89	3.94

	CRC	COT	AGE	ED	SS	PAIN	ENG
Min.	3.00	10.00	21.00	2.00	1.00	1.00	1.00
Max.	9.00	27.00	37.00	4.00	1.00	5.00	4.00
Mean	5.14	19.29	28.36	2.86	1.00	2.07	2.57
S.D.	1.70	4.83	4.57	.77	0.00	1.14	1.02

	DLC
Min.	0.00
Max.	7.00
Mean	1.43
S.D.	2.17

APPENDIX I

Statistics

i. Descriptive statistics continued

Control Group; n = 15

Variables

	SC	RD	SE	CG	T	CC	RC
Min.	4.00	8.00	4.00	2.00	23.00	1.00	2.00
Max.	11.00	11.00	11.00	15.00	47.00	9.00	9.00
Mean	7.80	9.87	7.93	7.47	33.53	5.40	5.07
S.D.	2.62	1.36	1.90	3.82	8.59	2.34	2.05

	CT	OT	CS	CR	CSE	CCG	CTT
Min.	3.00	29.00	1.00	3.00	0.00	1.00	6.00
Max.	18.00	65.00	5.00	6.00	3.00	5.00	19.00
Mean	10.40	43.87	3.27	4.93	1.13	2.47	11.80
S.D.	3.96	11.28	1.58	1.28	.99	1.46	4.35

	CRC	COT	AGE	ED.	SS	PAIN	ENG
Min.	1.00	7.00	20.00	2.00	0.00	1.00	2.00
Max.	8.00	27.00	36.00	4.00	1.00	4.00	4.00
Mean	4.40	16.20	26.73	2.60	.87	2.53	3.00
S.D.	2.00	5.49	4.86	.74	.35	.74	.66

	DLC
Min.	0.00
Max.	4.00
Mean	1.40
S.D.	1.50

APPENDIX I

Statistics

ii. Stem and Leaf Display of Variables

SC (SENSITIVITY TO CUES); n = 29

```
Min. is:       4.00
Lower Hinge:   7.00
Median:        8.00
Upper Hinge:  11.00
Max. is       11.00

              4   00
              5   00
              6   00
              7 H 000000
              8 M 000
             10   0000
             11 H 00000000
```

RD (RESPONSE TO DISTRESS); n = 29

```
Min. is:         8.00
Lower Hinge is:  9.00
Median:         11.00
Upper Hinge:    11.00
Max. is:        11.00

              8   00000
              9 H 000
             10   000000
             11 H 000000000000000
```

APPENDIX I

Statistics

ii. Stem and Leaf display (continued)

SE (SOCIAL EMOTIONAL GROWTH FOSTERING); n = 29

```
Min. is:          4.00
Lower Hinge:      7.00
Median:           8.00
Upper Hinge:     10.00
Max. is:         11.00
                4   0
                5
                6   000
                7 H 00000
                8 M 0000000
                9   0000
               10 H 0000
               11   00000
```

CG (COGNITIVE GROWTH FOSTERING); n = 29

```
Min is:          0.00
Lower Hinge:     5.00
Median:          9.00
Upper Hinge:    13.00
Maximum:        16.00

                0   0
                0   22
                0 H 4445555
                0   677
                0 M 899
                1   0001
                1 H 3333
                1   455
                1   66
```

APPENDIX I

Statistics

ii. Stem and Leaf Displays (continued)

T (CAREGIVER TOTAL); n = 29

Min. is:	21.00
Lower Hinge:	27.00
Median:	38.00
Upper Hinge:	44.00
Max. is:	49.00

```
2    1
2    3
2    455
2  H 6677
2
3    01
3    2
3    45
3
3  M 889
4    0
4    233
4  H 4555
4    77
4    89
```

CC (CLARITY OF CUES); n = 29

Min is:	1.00
Lower Hinge:	5.00
Median:	6.00
Upper Hinge:	8.00
Max. is:	10.00

```
 1    0
 2    00
 3    0
 4    0
 5  H 0000000
 6  M 00000
 7    0000
 8  H 000
 9    0000
10    0
```

APPENDIX I

Statistics

ii. Stem and Leaf Displays continued.

RC (RESPONSIVENESS TO CAREGIVER); n = 29

```
Min. is:        2.0
Lower Hinge:    4.0
Median:         5.0
Upper Hinge:    7.0
Max. is:       10.0

                2   0
                3   000
                4 H 000000
                5 M 0000000
                6   000
                7 H 00000
                8   00
                9   0
               10   0
```

CT (CHILD TOTAL); n = 29

```
Min. is:        3.0
Lower Hinge:    9.0
Median:        11.0
Upper Hinge:   14.0
Max. is:       20.0

               0   3
               0
               0   67
               0 H 888899
               1 M 0000111
               1   22223
               1 H 455
               1   677
               1   8
               2   0
```

APPENDIX I

Statistics

ii. Stem and Leaf Displays continued.

OT (OVERALL TOTAL SCORE, CAREGIVER & CHILD); n = 29

```
Min. is:        29.0
Lower Hinge:    39.0
Median:         46.0
Upper Hinge:    57.0
Max. is:        69.0

              2   9
              3   122334
              3 H 99
              4   03
              4 M 5556
              5   0023
              5 H 66778
              6   001
              6   59
```

CS (CONTINGENCY SENSITIVITY TO CUES); n = 29

```
Min. is:         1.0
Lower Hinge:     3.0
Median:          4.0
Upper Hinge:     5.0
Max. is:         5.0

              1   00
              2   00000
              3 H 00000
              4 M 0000
              5 H 0000000000000
```

APPENDIX I

Statistics

ii. Stem and leaf displays continued.

CR (CONTINGENCY RESPONSE TO DISTRESS); n = 29

Min. is: 3.0
Lower Hinge: 4.0
Median: 6.0
Upper Hinge: 6.0
Max. is: 6.0

```
3   0000
4 H 0000
5   000000
6 H 0000000000000000
```

CSE (CONTINGENCY SOCIAL EMOTIONAL GROWTH FOSTERING); n = 29

Min. is: 0.0
Lower Hinge: 1.0
Median: 1.0
Upper Hinge: 2.0
Max. is; 3.0

```
0   00000
1 M 000000000000
2 H 00000
3   0000000
```

CCG (CONTINGENCY COGNITIVE GROWTH FOSTERING); n = 29

Min. is: 0.0
Lower Hinge: 1.0
Median: 3.0
Upper Hinge: 4.0
Max. is: 5.0

```
0   000
1 H 000000
2   00000
3 M 00000
4 H 00000
5   00000
```

APPENDIX I

Statistics

ii. Stem and Leaf Displays continued.

CTT (CONTINGENCY CAREGIVER TOTALS); n = 29

Min. is: 6.0
Lower Hinge: 10.0
Median: 13.0
Upper Hinge: 17.0
Max. is: 19.0

```
 6    000
 7    0
 8    0
 9    00
10 H  0000
11    0
12
13 M  000
14    0
15    000
16    00
17 H  000
18    000
19    00
```

CRC (CONTINGENCY RESPONSIVENESS TO CAREGIVER); n = 29

Min. is: 1.0
Lower Hinge: 4.0
Median: 4.0
Upper Hinge: 6.0
Max. is: 9.0

```
1    0
2    00
3    000
4 M  0000000000
5    00
6 H  000000
7    000
8    0
9    0
```

APPENDIX I

Statistics

ii. Stem and Leaf displays continued.

COT (CONTINGENCY OVERALL TOTALS); n = 29

```
Min. is:          7.0
Lower Hinge:     14.0
Median:          18.0
Upper Hinge:     22.0
Max. is:         27.0

              0    7
              0    8
              1    0
              1    233
              1  H 4455
              1    6667
              1  M 888999
              2
              2  H 22233
              2    4
              2    677
```

APPENDIX I

Statistics

Nursing Child Assessment Teaching Scale (NCATS) Variables

iii. T-tests (one-tailed)

SC (SENSITIVITY TO CUES)

Group	N	Mean	SD
1.0	14	9.07	1.94
2.0	15	7.80	2.62

Separate Variances T = 1.490 DF = 25.7 Prob = .07
Pooled Variances T = 1.475 DF = 27 Prob = .08

RD (RESPONSE TO DISTRESS)

Group	N	Mean	SD
1.0	14	10.29	.91
2.0	15	9.87	1.36

Separate Variances T = .982 DF = 24.7 Prob = .17
Pooled Variances T = .969 DF = 27 Prob = .17

SE (SOCIAL EMOTIONAL GROWTH FOSTERING)

Group	N	Mean	SD
1.0	14	8.93	1.64
2.0	15	7.93	1.91

Separate Variances T = 1.510 DF = 26.8 Prob = .07
Pooled Variances T = 1.502 DF = 27 Prob = .07

CG (COGNITIVE GROWTH FOSTERING)

Group	N	Mean	SD
1.0	14	9.93	5.20
2.0	15	7.47	3.82

Separate Variances T = 1.446 DF = 23.8 Prob = .08
Pooled Variances T = 1.462 DF = 27 Prob = .08

T (TOTAL FOR CAREGIVER)

Group	N	Mean	SD
1.0	14	38.29	9.02
2.0	15	33.53	8.59

Separate Variances T = 1.451 DF = 26.6 Prob = .08
Pooled Variances T = 1.454 DF = 27 Prob = .08

APPENDIX I

Statistics

iii. T-tests continued.

CC (CLARITY OF CUES)

Group	N	Mean	SD
1.0	14	6.71	2.05
2.0	15	5.40	2.35

Separate Variances T = 1.605 DF = 26.9 Prob = .06
Pooled Variances T = 1.597 DF = 27 Prob = .06

RC (RESPONSIVENESS TO CAREGIVER)

Group	N	Mean	SD
1.0	14	5.86	1.75
2.0	15	5.07	2.05

Separate Variances T = 1.12 DF = 26.8 Prob = .14
Pooled Variances T = 1.11 DF = 27 Prob = .14

CT (CHILD TOTALS)

Group	N	Mean	SD
1.0	14	12.57	3.61
2.0	15	10.40	3.96

Separate Variances T = 1.54 DF = 27 Prob = .07
Pooled Variances T = 1.54 DF = 27 Prob = .07

OT (OVERALL TOTAL)

Group	N	Mean	SD
1.0	14	50.86	10.98
2.0	15	43.87	11.28

Separate Variances T = 1.692 DF = 26.9 Prob = .05
Pooled Variances T = 1.690 DF = 27 Prob = .05

CS (CONTINGENCY SENSITIVITY TO CUES)

Group	N	Mean	SD
1.0	14	4.21	.98
2.0	15	3.27	1.58

Separate Variances T = 1.96 DF = 23.5 Prob = .03
Pooled Variances T = 1.93 DF = 27 Prob = .03

APPENDIX I

Statistics

iii. T-tests continued.

CR (CONTINGENCY RESPONSIVENESS TO DISTRESS)

Group	N	Mean	SD
1.0	14	5.29	.91
2.0	15	4.93	1.28

Separate Variances T = .858 DF = 25.3 Prob = .17
Pooled Variances T = .848 DF = 27 Prob = .20

CSE (CONTINGENCY SOCIAL EMOTIONAL GROWTH FOSTERING)

Group	N	Mean	SD
1.0	14	1.86	1.03
2.0	15	1.13	.99

Separate Variances T = 1.929 DF = 26.7 Prob = .03
Pooled Variances T = 1.932 DF = 27 Prob = .03

CCG (CONTINGENCY COGNITIVE GROWTH FOSTERING)

Group	N	Mean	SD
1.0	14	2.79	1.89
2.0	15	2.47	1.46

Separate Variances T = .507 DF = 24.5 Prob = .30
Pooled Variances T = .511 DF = 27 Prob = .30

CTT (CONTINGENCY CAREGIVER TOTAL)

Group	N	Mean	SD
1.0	14	14.14	3.94
2.0	15	11.80	4.35

Separate Variances T = 1.53 DF = 27 Prob = .07
Pooled Variances T = 1.52 DF = 27 Prob = .07

CRC (CONTINGENCY RESPONSIVENESS TO CAREGIVER)

Group	N	Mean	SD
1.0	14	5.14	1.70
2.0	15	4.40	1.99

Separate Variances T = 1.08 DF = 26.8 Prob = .14
Pooled Variances T = 1.08 DF = 27 Prob = .15

APPENDIX I

Statistics

iii. T-tests continued.

COT (CONTINGENCY OVERALL TOTAL)

Group	N	Mean	SD
1.0	14	19.29	4.83
2.0	15	16.20	5.49

Separate Variances T = 1.610 DF = 26.9 Prob = .06
Pooled Variances T = 1.602 DF = 27 Prob = .06

APPENDIX J

Pearson Correlation Matrix of NCATS Scores and Sample Descriptors

i. Control Group; N = 15

	SC	RD	SE	CG	T
SC	1.000				
RD	0.494	1.000			
SE	0.525	0.466	1.000		
CG	0.838	0.634	0.613	1.000	
T	0.861	0.761	0.683	0.884	1.000
CC	0.349	0.107	0.515	0.407	0.399
RC	0.573	0.286	0.366	0.571	0.570
CT	0.510	0.237	0.486	0.554	0.546
OT	0.839	0.658	0.690	0.865	0.954
CS	0.927	0.618	0.599	0.808	0.874
CR	0.506	0.982	0.437	0.651	0.764
CSE	0.313	0.440	0.799	0.512	0 478
CCG	0.661	0.504	0.654	0.793	0.681
CTT	0.779	0.783	0.748	0.868	0.880
CRC	0.331	0.180	0.177	0.321	0.346
COT	0.736	0.685	0.656	0.803	0.822
AGE	0.359	0.276	-0.033	0.073	0.336
ED	0.325	0.372	0.183	0.376	0.398
SS	-0.186	0.110	-0.121	-0.057	-0.069
PAIN	-0.161	-0.208	-0.326	-0.144	-0.182
ENG	0.416	-0.080	0.000	0.372	0.153
DLC	-0.014	-0.182	-0.065	0.127	-0.045

	CC	RC	CT	OT	CS
CC	1.000				
RC	0.645	1.000			
CT	0.909	0.902	1.000		
OT	0.624	0.757	0.771	1.000	
CS	0.469	0.633	0.610	0.884	1.000
CR	0.152	0.328	0.287	0.677	0.645
CSE	0.435	0.487	0.514	0.545	0.492
CCG	0.608	0.419	0.584	0.717	0.656
CTT	0.518	0.578	0.619	0.886	0.872
CRC	0.649	0.919	0.856	0.568	0.440
COT	0.645	0.791	0.800	0.907	0.850
AGE	-0.065	0.095	0.024	0.268	0.391
ED	-0.148	0.208	0.010	0.303	0.344
SS	-0.148	-0.383	-0.472	-0.221	-0.188
PAIN	-0.171	-0.025	-0.126	-0.187	-0.251
ENG	0.371	0.106	0.275	0.213	0.345
DLC	0.234	0.014	0.163	0.029	-0.018

APPENDIX J

Pearson Correlation Matrix

i. Control Group continued.

	CR	CSE	CCG	CTT	CRC
CR	1.000				
CSE	0.458	1.000			
CCG	0.516	0.548	1.000		
CTT	0.806	0.704	0.850	1.000	
CRC	0.235	0.369	0.325	0.422	1.000
COT	0.723	0.691	0.791	0.944	0.697
AGE	0.295	-0.333	-0.153	0.102	0.027
ED	0.348	0.078	0.053	0.263	0.068
SS	-0.021	-0.355	-0.288	-0.252	-0.428
PAIN	-0.110	-0.104	-0.312	-0.252	-0.039
ENG	-0.085	-0.220	0.449	0.201	0.000
DLC	-0.097	0.154	0.170	0.057	0.014

	COT	AGE	ED	SS	PAIN
COT	1.000				
AGE	0.090	1.000			
ED	0.233	0.028	1.000		
SS	-0.355	0.019	0.331	1.000	
PAIN	-0.185	-0.096	0.157	-0.255	1.000
ENG	0.159	0.067	-0.148	-0.000	-0.440
DLC	0.050	-0.258	-0.619	-0.297	0.115

	ENG	DLC
ENG	1.000	
DLC	0.218	1.000

APPENDIX J

Pearson Correlation Matrix

ii. Treatment group; N = 14

	SC	RD	SE	CG	T
SC	1.000				
RD	0.508	1.000			
SE	0.897	0.374	1.000		
CG	0.897	0.523	0.875	1.000	
T	0.922	0.577	0.928	0.979	1.000
CC	0.083	0.047	0.199	0.394	0.300
RC	0.412	0.124	0.479	0.465	0.476
CT	0.246	0.087	0.345	0.449	0.401
OT	0.839	0.503	0.876	0.952	0.954
CS	0.886	0.271	0.780	0.702	0.771
CR	0.508	1.000	0.374	0.523	0.577
CSE	0.778	0.375	0.862	0.748	0.802
CCG	0.823	0.439	0.889	0.955	0.944
CTT	0.935	0.607	0.931	0.948	0.986
CRC	0.346	-0.078	0.472	0.392	0.398
COT	0.865	0.468	0.926	0.912	0.945
AGE	0.188	-0.137	0.086	0.205	0.164
ED	0.265	0.062	0.052	0.132	0.150
SS	.	.	.	.	.
PAIN	0.102	-0.316	0.126	-0.181	-0.092
ENG	0.329	-0.024	0.303	0.271	0.291
DLC	-0.336	0.011	-0.379	-0.501	-0.435

	CC	RC	CT	OT	CS
CC	1.000				
RC	0.802	1.000			
CT	0.957	0.940	1.000		
OT	0.561	0.701	0.658	1.000	
CS	-0.044	0.200	0.072	0.657	1.000
CR	0.047	0.124	0.087	0.503	0.271
CSE	0.380	0.673	0.542	0.837	0.494
CCG	0.280	0.386	0.347	0.889	0.779
CTT	0.234	0.439	0.345	0.924	0.813
CRC	0.760	0.963	0.899	0.623	0.165
COT	0.459	0.698	0.599	0.974	0.722
AGE	0.012	0.113	0.061	0.155	0.120
ED	-0.174	0.041	-0.079	0.097	0.249
SS	.	.	.	.	.
PAIN	-0.352	-0.110	-0.253	-0.159	0.193
ENG	0.011	0.136	0.072	0.263	0.333
DLC	0.212	-0.124	-0.181	-0.416	-0.519

APPENDIX J

Pearson Correlation Matrix

ii. Treatment group continued.

	CR	CSE	CCG	CTT	CRC
CR	1.000				
CSE	0.375	1.000			
CCG	0.439	0.657	1.000		
CTT	0.607	0.785	0.945	1.000	
CRC	-0.078	0.672	0.345	0.364	1.000
COT	0.468	0.878	0.893	0.944	0.650
AGE	-0.137	0.208	0.152	0.125	0.151
ED	0.062	0.069	0.136	0.159	0.017
SS	.	.	.	.	.
PAIN	-0.316	0.009	-0.064	-0.054	0.034
ENG	-0.024	0.158	0.189	0.209	0.083
DLC	0.011	-0.177	-0.557	-0.439	-0.101

	COT	AGE	ED	SS	PAIN
COT	1.000				
AGE	0.156	1.000			
ED	0.136	0.562	1.000		
SS	.	.	.	1.000	
PAIN	-0.032	-0.359	0.100	.	1.000
ENG	0.199	0.069	-0.084	.	-0.038
DLC	-0.394	-0.412	-0.420	.	0.266

	ENG	DLC
ENG	1.000	
DLC	0.020	1.000